Prevalence of Cardiovascular Complications and

Anti-platelet Therapy Used among Thai Type 2 Diabetes Patients in 2012

Mrs. Soe Sandi Tint

A Thesis Submitted in Partial Fulfillment of the Requirements

for the Degree of Master of Science Program in Health Development

Faculty of Medicine

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โซ แซน ดิ ทิ น ท์ :
ความชุกของภาวะแทรกซ้อนทางระบบหัวใจและหลอดเลือดและความสัมพันธ์ระหว่างการใช้ยาแอสไพรินและภาวะแทรกซ้อนทางระบบหัวใจและหลอดเลือดของผู้ป่วยเบาหวานชนิดที่ 2 ในประเทศไทย : 2012 (Prevalence of Cardiovascular Complications and Anti-platelet Therapy Used among Thai Type 2 Diabetes Patients in 2012) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: พิเชฐ สัมปทานุกุล, 66 หน้า.

□ □ □ □ □ □ □ □ □: เบาหวาน ชนิดที่ 2 เป็นโรคหนึ่งที่พบมากทั่วโลก เป็นภาวะที่ก่อให้เกิดโรคแทรกซ้อนเรื้อรังต่างๆ ภาวะแทรกซ้อนทางระบบหัวใจและหลอดเลือด หรือภาวะแทรกซ้อนที่เกิดจากพยาธิสภาพในหลอดเลือดใหญ่ สามารถป้องกันได้บ้าง จากการให้ยาต้านการทำงานของเกล็ดเลือด ซึ่งนิยมใช้ยาแอสไพริน ในการศึกษานี้ จะได้วิเคราะห์อัตราการจ่ายยาต้านเกล็ดเลือดให้ผู้ป่วยทั้งเป็นการป้องกันระดับปฐมภูมิและทุติยภูมิ ของผู้ป่วยเบาหวาน ชนิดที่สอง ของคนไทย ใน ปี ค.ศ. 2012

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เพื่อคำนวณความชุกของภาวะแทรกซ้อนที่เกิดจากพยาธิสภาพในหลอดเลือดใหญ่ และร้อยละของการจ่ายยาต้านเกล็ดเลือดให้ผู้ป่วยที่ไม่พบ และ พบ มีโรคเรื้อรังที่เกิดจากพยาธิสภาพในหลอดเลือดใหญ่ ของผู้ป่วยเบาหวาน ชนิดที่สอง ของคนไทย ใน ปี ค.ศ. 2012

□ □ □ □ □ □ □ □ □ □ □ □ □ □ □: การศึกษานี้เป็นส่วนหนึ่งของการศึกษา ในโครงการ เบาหวาน/ความดันโลหิตสูง ของประเทศไทย ข้อมูลต่างๆ เก็บย้อนหลังจากสารสนเทศทางการแพทย์ที่ได้จากการสุ่มตัวอย่างแบบเป็นลำดับชั้น ของโรงพยาบาลที่อยู่ในสังกัดของกระทรวงสาธารณสุขทั่วประเทศ และ โรงพยาบาลและคลินิกที่อยู่ในกรุงเทพและปริมณฑลที่ใช้สิทธิ์ของประกันสังคม ซึ่งมีจำนวนทั้งสิ้น 602 แห่ง ผู้นิพนธ์ใช้แหล่งข้อมูลทุติยภูมินี้ ในการวิเคราะห์

□ □ □ □ □ □ □ □ □ □: ในจำนวนผู้ป่วยเบาหวานชนิดที่สอง 29,374 คน ร้อยละ 5.8 (ค่าความเชื่อมั่นที่ร้อยละ95 อยู่ที่ 5.6-6.2) มีภาวะแทรกซ้อนที่เกิดจากพยาธิสภาพในหลอดเลือดใหญ่ โดยที่ ร้อยละ 7, 8.2, และ 4.6 เป็นผู้ป่วยอยู่โรงพยาบาล ระดับ โรงพยาบาลศูนย์ โรงพยาบาลทั่วไป และโรงพยาบาลชุมชน ตามลำดับ การสั่งยาต้านการทำงานของเกล็ดเลือดโดยรวมของผู้ป่วยที่มีภาวะแทรกซ้อนที่เกิดจากพยาธิสภาพในหลอดเลือดใหญ่ อยู่ที่ร้อยละ 84.9 (ค่าความเชื่อมั่นที่ ร้อยละ 95 อยู่ที่ 82.9-86.6) ขณะที่การสั่งยาต้านการทำงานของเกล็ดเลือดโดยรวมของผู้ป่วยที่ไม่มีภาวะแทรกซ้อนที่เกิดจากพยาธิสภาพในหลอดเลือดใหญ่ อยู่ที่ร้อยละ 57.1 (ค่าความเชื่อมั่นที่ ร้อยละ 95 อยู่ที่ 56.5-57.7) ผู้ป่วยที่มีภาวะแทรกซ้อนที่เกิดจากพยาธิสภาพในหลอดเลือดใหญ่ส่วนใหญ่ไปปรับยาที่โรงพยาบาลชุมชน การสั่งยาต้านการทำงานของเกล็ดเลือดให้ผู้ป่วยที่ไม่มีภาวะแทรกซ้อนที่เกิดจากพยาธิสภาพในหลอดเลือดใหญ่มีแนวโน้มที่จะให้แก่ผู้ป่วยสูงอายุผู้ชาย ผู้ที่มีประวัติหยุดสูบบุหรี่ และผู้ป่วยที่มีความดันโลหิตสูง

□ □ □ □ □ □ □ □ □ □ □ □ □ □: ความชุกของภาวะแทรกซ้อนทางระบบหัวใจและหลอดเลือด หรือภาวะแทรกซ้อนที่เกิดจากพยาธิสภาพในหลอดเลือดใหญ่ ของผู้ป่วยเบาหวานชนิดที่สองในคนไทยในปี ค.ศ. 2012 อยู่ในเกณฑ์ที่คาดหมาย การสั่งยาต้านการทำงานของเกล็ดเลือดหรือยาแอสไพรินให้ผู้ป่วยที่มีภาวะแทรกซ้อนที่เกิดจากพยาธิสภาพในหลอดเลือดใหญ่มีอัตราที่ต่ำกว่าเป้าหมายที่ควรจะมีร้อยละ 90

สาขาวิชา การพัฒนาสุขภาพ	ลายมือชื่อนิสิต ....
ปีการศึกษา 2557	ลายมือชื่อ อ.ที่ปรึกษาหลัก ....

5674651730 : MAJOR HEALTH DEVELOPMENT

KEYWORDS: ANTI-PLATELET / CARDIOVASCULAR COMPLICATIONS / PREVALENCE / GLYCEMIC CONTROL / TYPE 2 DIABETES MELLITUS / THAILAND

SOE SANDI TINT: Prevalence of Cardiovascular Complications and Anti-platelet Therapy Used among Thai Type 2 Diabetes Patients in 2012. ADVISOR: PROF. PICHET SAMPATANUKUL, M.D., 66 pp.

Background: Diabetes Mellitus type 2 (T2DM) is one of the global pandemic that can cause several chronic complications. The macro vascular complication is able to be prevented somehow by anti-platelet therapy. The primary and secondary prevention programs were analyzed at different levels of cares among Thai T2DM patients in 2012.

Objective: To describe the prevalence of cardiovascular complications and the percentage of anti-platelet prescriptions without and with cardiovascular complications events at different levels of cares among Thai T2DM patients in 2012.

Materials and method: This study was part of the Thailand DM/HT study. The data was retrospectively collected from the medical records from a stratified sampling of public hospitals under Ministry of Public Health and hospitals and clinics in Bangkok that under the national health security office program, altogether 602 institutes. The authors used this secondary source data set to analyze.

Results: Of the 29,374 T2DM patients, 5.8% (95% CI: 5.6 to 6.2) had overall cardiovascular complications and 7%, 8.2% and 4.6 % were from regional center hospital, provincial general hospital and community hospital respectively. Overall 84.8% (95% CI: 82.9 to 86.6) of T2DM patients with cardiovascular complications were prescribed anti-platelet medications and 57.1% (95% CI: 56.5 to 57.7) of patients with no cardiovascular complications were prescribed anti-platelet therapy. Most patients with cardiovascular complications went to community hospital for anti-platelet drugs. Prescriptions in non-cardiovascular complications group were more likely in male and older patients, history with quit smoking and hypertension patients.

Conclusion: The overall prevalence of cardiovascular complications in Thai T2DM patients in 2012 was in the range of expectation. The use of anti-platelet therapy as secondary prevention was lower than the target figure of 90%.

Field of Study: Health Development   Student's Signature _____
Academic Year: 2014   Advisor's Signature _____

ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION

Diabetes Mellitus and Cardiovascular complications

Diabetes Mellitus (DM) is one of the major public health problems and its prevalence is increasing globally. Asian countries contribute to more than 60% is on the rise (1). In Thailand, the prevalence of diabetes is about 8% ranks in the average mean of the world records (2). Chronic complications are those which occur over a longer period of time after being suffered from diabetes and involve changes in blood vessels, tissue and organs. Persistent hyperglycemia damages blood vessels which may lead to many disorders, such as macro vascular and micro vascular complications. In people with diabetes, the cardiovascular diseases are the major cause of morbidity and mortality. Patients with diabetes have twice the risk of myocardial infarction (MI) and stroke comparing to general population, and had a 2–4 fold increased risk of cardiovascular events than those without diabetes (3).In general, diabetes patients have shown a similar risk of developing cardiovascular events as no diabetes patients with history of MI (4).In the worldwide INTERHEART study of patients from 52 countries, diabetes accounted for 10% of the population attributable risk for first MI (5). Transient ischemic attacks are two to six times more common in DM patients and the risk of vascular dementia is also augmented.

Damage to blood vessels within the eye can result in diabetic retinopathy and ultimately blindness. Pathological changes within the kidneys cause diabetic nephropathy and renal insufficiency, while damage to peripheral nervous tissue will ultimately lead to diabetic neuropathy. The risk of peripheral vascular disease (PVD) in diabetics is four times higher (6, 7) and is known to increase the risk of lower limb amputation by 15–40 times compared to the general population. It is well known that cardiovascular complications are the major outcomes of type 2 diabetes mellitus (T2DM) progress, which reduce the quality of life of patients, heavy burdens to the health care system, and increase diabetic mortality (8). Moreover, people with

coexisting diabetes and hypertension are at increased risk of atherosclerosis, retinopathy, renal failure and non-traumatic amputations, and cardiovascular diseases. In Thailand, approximately half of the diabetes patients had hypertension in 2012 (9).

According to the report from International Diabetes Federation, cardiovascular complications account for approximately 50% of all deaths among DM patients in the industrialized countries. Not only are these complications debilitating to the patient, but they are accompanied by a significant economic burden to the patients, family members, and the nation's health care budget. Therefore it is important for the policy makers and health care personal to know the country's prevalence figure.

Anti-platelet treatment for prevention of cardiovascular complications

A number of mechanisms for increased risk of cardiovascular complications in diabetes patients have been proposed including increased atherogenesis and thrombus or plaque formation. There are two major causes for atherogenesis and thrombus formation: increased platelet reactivity and concomitant presence of multiple cardiovascular risk factors. According to the mechanism, hyperglycemia, hyperlipidemia, insulin resistance, endocrine dysfunction, oxidative stress and inflammation can lead to increased platelet reactivity (10). Among these, platelets have a key role in atherogenesis and its thrombotic complications in patients with DM. Moreover, diabetic patients contribute to enhance atherothrombotic risk because of hyperglycemia (11).

Anti-platelet agents are effective in primary and secondary prevention intensions of arterial thrombosis. Aspirin has been shown to be effective in reducing cardiovascular morbidity and mortality in high risk patients with MI or stroke (10). For patients who cannot tolerate aspirin therapy, alternative anti-platelets such as clopidogrel can be used. In 2007, the American Diabetes Association and the American Heart Association jointly recommended that aspirin therapy (75-162 mg/day) be used as a primary prevention in diabetes patients with increased cardiovascular risk include men over 50 years of age and women over 60 years of age and patients with major risk factors such as hypertension, dyslipidemia, family history of cardiovascular complication and albuminuria (11). But the recommendations were

argued recently (12). The Food and Drug Administration (FDA) suggested that aspirin should not be sued for primary prevention due to increased risk of cerebral and GI bleeding. However, aspirin still plays major role for secondary prevention of cardiovascular diseases in T2DM patients (13).The recommended dose for aspirin for secondary prevention in T2DM patients is 75 to 162 mg daily according to results from meta-analysis (13, 14). Finally, the decision to give aspirin must be taken on an individual patient basis, after a careful evaluation of the balance between the expected benefits and the risk.

Status of glycemic control and treatment of diabetes

A study found that in T2DM patients, each percentage point reduction in HbA1c level was associated with 35% reduction in micro vascular complications and 7% reduction in all case mortality (10). Therefore, it is also important to know the glycemic control status of Thai T2DM patients not only to reduce the prevalence of diabetes in Asian countries but also to improve glycosylated hemoglobin (HbA1c) control in order to decrease the burden of diabetes and its complications. In order to prevent hyperglycemia, American Diabetic Association recommended lifestyle modifications including modified diet, increased physical activity, and weight loss are critical for all diabetes patients to achieve the target goal and metformin is the preferred initial pharmacological agent for T2DM (if tolerated and not contraindicated).But Thailand has its own guidelines for diabetes treatment(only available in Thai)endorsed by the Thai Diabetes Association, the Endocrine Society of Thailand, and the Ministry of Public Health. The guidelines are updated every three to four years and the latest version was published in 2011 (11).

Although patients are treated by aspirin, the prevalence of cardiovascular complications among diabetes patients is still high all over the world. But in Thailand, most of the study for the prevalence of cardiovascular complications and used of anti-platelet therapy were done at the tertiary care medical centers and university hospitals. So, there is a large variation in the estimates of the prevalence and costs of cardiovascular complications for Thai T2DM patients and more studies at different levels of care are needed to get a full picture of the prevalence of cardiovascular complications and their-anti-platelet therapy usage. So, the objectives of this study

were to describe the prevalence of cardiovascular complications and percentage of anti-platelet prescription before and after the event of cardiovascular complications at different levels of care among Thai T2DM patients and to analyze the association between anti-platelet therapy used and size of hospital, patients' characteristics of Thai T2DM patients with and without cardiovascular complications and to describe the baseline characteristics, status of glycemic control and use of anti-diabetes medications among Thai T2DM patients with cardiovascular complications in 2012.

CHAPTER II

LITERATURE REVIEW

Prevalence of macro and micro vascular complications

The literatures were reviewed through Pub Med database using the keywords of anti-platelet medications, cardiovascular complications, glycemic control, prevalence, type 2 diabetes mellitus, Thailand. Firstly, found the prevalence of cardiovascular complications in Asian countries. One of the study in 2012 reported that Asian countries have a higher risk of developing diabetic complications because they develop the disease earlier. As Asian populations develop diabetes at a young age, they live long enough to develop the complications too, resulting in high rates of morbidity and early mortality (1).

Many studies reported the prevalence of chronic complications and its associated risk factors in different countries. The prevalence of cardiovascular complications was 13.4% among 500 subjects in Sri Linka 1993 (15).The report in 2007 from United Arab among 513 diabetes patients showed that 3.5% had cerebrovascular disease, 14.4% had coronary artery disease and 11.6% had peripheral vascular disease (3).In 2008, the ENTRED study from France reported that 20% of diabetes patients had cardiovascular complications (16). According to China in 2010 report, 33.4% of the 1,524 subjects had macro vascular complications (17). Therefore, the prevalence of macro vascular complications in type 2 diabetes varied from 13.4-33.4%.

There was a Thailand diabetes registry (TDR) project in 2003 to identify the characteristics of Thai diabetes patients in tertiary care center and to determine the extent of long term diabetes complications. From that project, among 9,284 adult T2DM patients from 11 tertiary care medical centers, there was 8.1% of ischemic heart disease, 4.4% of cerebrovascular disease and 11.4% of peripheral vascular disease including amputation, 1.6% foot ulcer and absence of peripheral pulse (18). This project also had a second component which was a three year cohort study from

2003 to 2006. From that cohort study in 2006, among 1078 of T2DM patients from 37 primary health care center, 0.7% and MI, 1.9% had stroke and 34% had peripheral neuropathy respectively (19). And also from one study in Thailand reported that among 722 diabetes patients from out-patients department, 28.9% developed cardiovascular complications, 10.6% got cerebrovascular complications and 40% of patients lead to peripheral vascular complications (20). So, the overall prevalence of cardiovascular complications of Thai T2DM patients from tertiary care level varied between 4.4 to 11.4% and from primary care center varied between 10 to 30%. In Thailand, overall, prevalence of diabetic retinopathy (DR) ranged between 13.6-31.2% while the prevalence of diabetes nephropathy ranged between 24-43.8% and was higher in patients with concomitant DR (18). But the subjects for all of the above studies were from tertiary care center and out-patients departments.

Anti-platelet treatment for prevention of cardiovascular complications

For the use of anti-platelet therapy as primary prevention, many studies had done. 2005, a large project, the Vermont Diabetes Information System (VDIS), a cluster-randomized trial was done and the prevalence of anti-platelet therapy in diabetes patients was conducted as a part of this large study in United State. According to that study, the prevalence of anti-platelet use was 54% overall in 785 subjects and among that, 46% were women, 63% were men and 45% with no cardiovascular complications and 78% with cardiovascular complications (21). And also from that study conclude that despite clinical practice guidelines recommend for anti-platelet therapy for diabetes patients, there were still eligible patients left not received it, mainly under 65 women and patients without known cardiovascular diseases. Other studies from different countries also reported that the use of anti-platelets drugs were low especially in type 2 diabetes patients with no cardiovascular complications. The prevalence of aspirin used in type 2 diabetes patients with no cardiovascular complication was 13% to 48% in different countries (3, 16, 17, 20).

Several randomized trials have examined the effect of aspirin for primary prevention for cardiovascular events. But most of the studies did not focus specially on patients with diabetes. The population based trials about the effect of aspirin were British Medical Doctors (BMD) (22), Physicians' Health Study (PHS) (15),

Thrombosis Prevention Trial (TPT) (23), Hypertension Optimal Treatment (HOT) (24) and Primary Prevention Project (PPP) (25). The percentage of diabetes patients in TPT, PHS and BMD were only 1-2% compared to 22% in PPP (11).

In 2008, two other trails that enrolled only diabetes patients were Japanese Primary Prevention of Athe2rosclerosis with Aspirin for Diabetes (JPAD) (26) and the Prevention and Progression of Arterial Disease and Diabetes (POPADAD) (27) conducted. But no single trial provides definite results. According to the meta-analysis, the effects of aspirin on cardiovascular complications were still inconclusive. Moreover, in real life, most of the clinicians give aspirin as secondary prevention in patients with previous history of any form of cardiovascular complications but still unclear to give aspirin for primary prevention.But according to the results from meta-analyses, taking anti-platelet agents reduced the incidence of recurring cardiovascular events from 18.5% to 22.3% in T2DM patients (13, 14, 28, 29).From these trials, low dose aspirin (75 to 150 mg daily) was found to be effective as higher dose and less bleeding complications.

Cross-sectional surveys were conducted in UK from 1996 to 2000 to find out the use of aspirin as primary and secondary prevention: UK Prospective Diabetes Study (UKPDS) study. In this study, among 2304 of total diabetes patients, the percentages for aspirin used as secondary prevention range between 76 to 82% (30). There was also a study on evaluation of the uses of aspirin in a diabetes outpatient population in southern Thailand in 2004. In this study, among total 1051 diabetes patients from regional, community and teaching hospital of Songkla province, the percentages of aspirin used for primary prevention were between 5 to 29%. A few diabetes patients from that study had angina, or previous stroke and they were all prescribed with aspirin as secondary prevention (31).But this study was done in only one community hospital among 16 community hospitals of Songkla province and so this results could not be representative.

Status of glycemic control and treatment of diabetes

When finding for the status of glycemic control in T2DM patients, Thai Diabetes Registry Project on 2006 reported that only 26.3% of 2,342 participants got control of HbA1c less than 7% (21) and also in 2009, among 140 diabetes patients, 56% of patients led to poor glycemic status in Thailand (22). But these studies were based on small sample size and only found the glycemic control of general T2DM population. According to treatment guidelines for Thai T2DM patients in 2014, if the patients had HbA1c <8%, recommend to change to life style modifications and if more than >=8%, start to anti-diabetes medications (17).

In summary: The prevalence of cardiovascular complications in different level of care that covering all the regions of Thailand as well as the prevalence of anti-platelet therapy used as primary and secondary prevention programs in one period still need to resolve. The gap of knowledge is also at the primary level of care in Thailand.
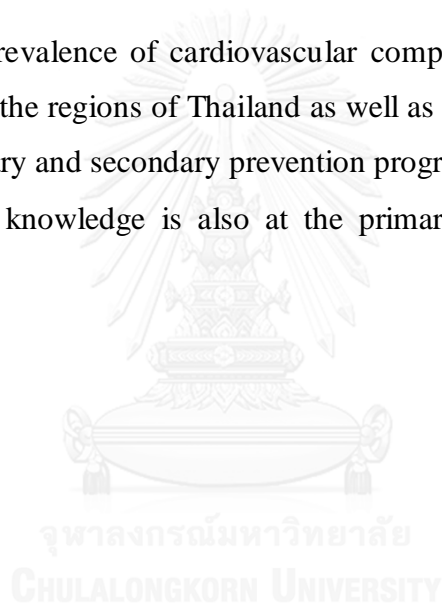
CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Questions

3.1.1 Primary research question

What is the prevalence of cardiovascular complications in Thai T2DM patients at different levels of cares in 2012?

3.1.2 Secondary research questions

1. What is the prevalence of anti-platelet therapy used among Thai T2DM patients with and without cardiovascular complications at different levels of cares in 2012?

2. What are the association between anti-platelet therapy used and size of hospital, patients' characteristics of Thai T2DM patients with and without cardiovascular complications in 2012?

3. What are the baseline characteristics, glycemic control status and use of anti-diabetes medications among Thai T2DM patients with cardiovascular complications in 2012?

3.2 Objectives

3.2.1 Primary objective

To describe the prevalence of cardiovascular complications in Thai T2DM patients at different levels of cares in 2012

3.2.2 Secondary objectives

1. To find out the prevalence of anti-platelet therapy used among Thai T2DM patients with and without cardiovascular complications at different levels of cares in 2012

2.To analyze the association between anti-platelet therapy used and size of hospital, patients' characteristics of Thai T2DM patients with and without cardiovascular complications in 2012

3. To describe the baseline characteristics, status of glycemic control and use of anti-diabetes medications among Thai T2DM patients with cardiovascular complications in 2012

3.3 Statistical hypothesis

Null Hypothesis

1. The prevalence of cardiovascular complications in Thai T2DM patients in 2012 lies between 4 to 10%

2. The use of anti-platelet therapy as secondary prevention was lower than the target 90%.
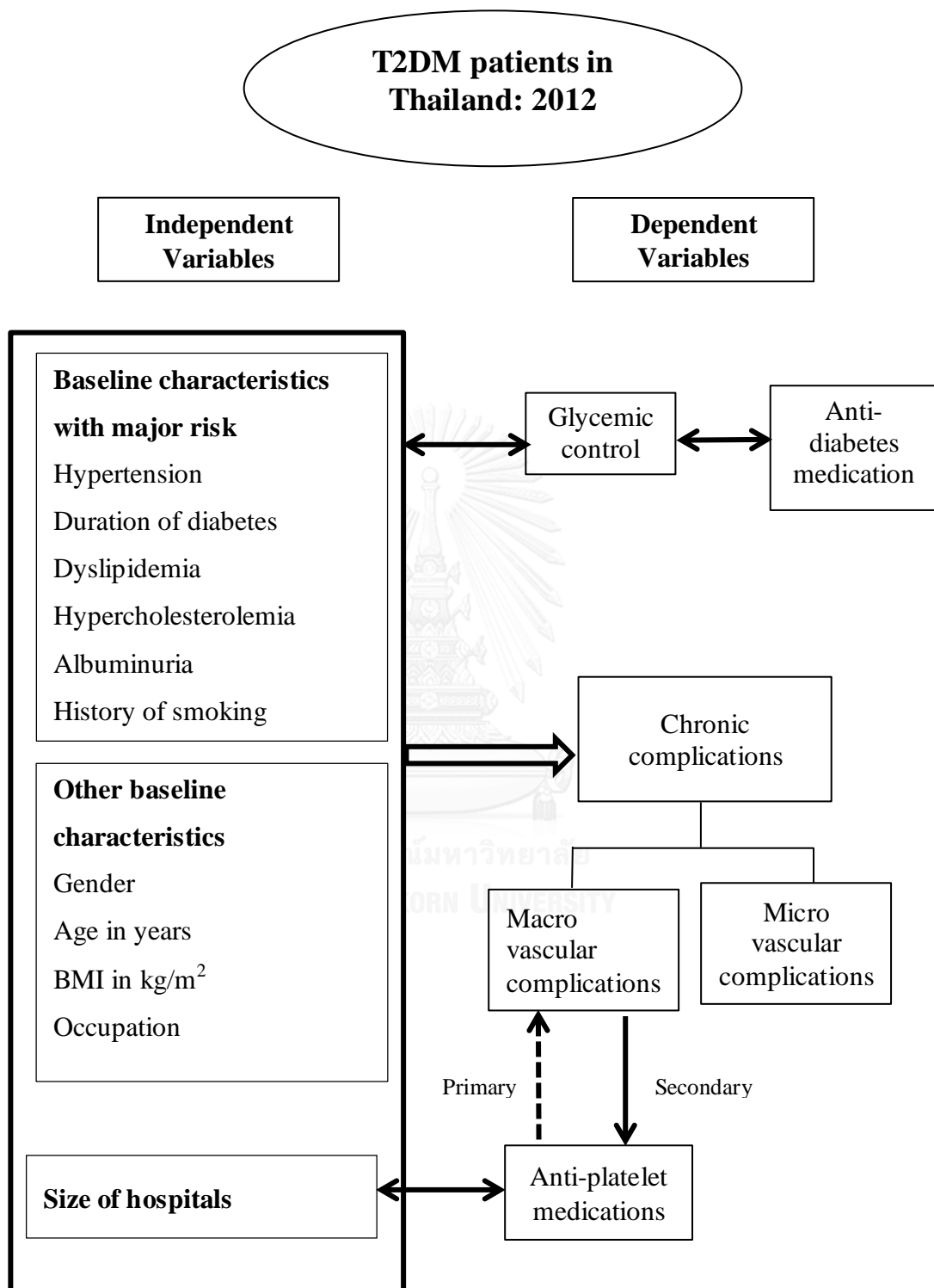
Alternative Hypothesis

1. The prevalence of cardiovascular complications in Thai T2DM patients in 2012 does not lie between 4 to 10%

2. The use of anti-platelet therapy as secondary prevention was higher than the target 90%

3.4 Conceptual framework

Primary prevention: Prescribed anti-platelet medications to prevent cardiovascular
complications before they occur

Secondary prevention: Prescribed anti-platelet medications in the prevention of
cardiovascular complications or recurrence of an established
condition

3.5 Keywords

Anti-platelet, Cardiovascular complications, Prevalence, Glycemic control, Type 2 Diabetes Mellitus, Thailand

3.6 Operational definitions

3.6.1 Age

Age refers to the last completed birthday at the time of interview.

3.6.2 Body Mass Index

This is a weight-to-high ratio, calculated by dividing weight in kilograms by the square of height in meters and used as an indicator of obesity and underweight. According to WHO criteria,

BMI in kg/m^2

<18.5 (underweight)

18.5-24.99(normal)

25-25.99 (overweight)

>30 (obesity)

3.6.3 Duration of Diabetes

Time duration of diabetes after diagnosed as type 2 diabetes by the physicians, by date, month and year.

3.6.4 Type 2 Diabetes Mellitus

According to American Diabetes Association, a patient with fasting blood glucose level (FBS) $\geq$ 126mg/dl (7mmol/l) with or without hypertension was defined as type 2 diabetes.

3.6.5 Hypertension

According to European Guideline for cardiovascular complications prevention Systolic blood pressure >= 140 mmHg and diastolic blood pressure >=90 mmHg was defined as Hypertension.

3.6.6 Occupation

Patients who are farmers and day labors were categorized as wage-based workers, unemployed person, student, monk and retired government employee were defined as non-workers and trader, private corporation officer and own business were defined as non-wage-based workers.

3.6.7 Size of hospitals

Hospitals with more than 500 beds was defined as regional center hospital, between 200- 500 beds was defined as provincial general hospital and 10 to 120 beds hospital was defined as community hospital. All the university hospitals were not included in this study.

3.6.8 Anti-platelet therapy

 Patients with cardiovascular who were on low doses of aspirin (75–162 mg/day) within one year and the other related drug uses was clopidogrel within one year regardless of previous history of taken aspirin or any other drug, and compliance to the drugs were defined as secondary prevention by anti-platelet therapy.

3.6.9 Dyslipidemia

Patients with serum triglycerides $\geq$ 1.7 mmol/l ($\geq$ 150 mg/l) and HDL levels < 1.03 mmol/l (< 40 mg/dl) was defined as dyslipidemia.

3.6.10 Albuminuria

Testing of urine by dipstick test during the last 12 month follow up period and if presence of protein >20mg/dl in the urine was defined as albuminuria.

3.6.11 Glycemic control status

A patient's glycosylated hemoglobin (HbA1c) level is an indicator of the status of glycemic control over the previous 3 months. According to American Diabetes Association, a cut-off point of < 7% indicates optimal glycemic control and if >=7% was defined as uncontrolled for blood glucose level. But in Thailand, it has own guidelines for treatment and the cut-off point of HbA1c level <=8% is the target glycemic level. This study used HbA1c <=8% as the target glycemic control level according to Thai guideline.

3.6.12 Cardiovascular complications

Patients with at least one kind of following complications included macro vascular complications such as coronary artery complications, cerebrovascular complications and peripheral vascular complications were defined as cardio vascular complications. Among them, coronary artery complications include: angina pectoris, congestive heart failure, myocardia infarct and coronary revascularization. Cerebrovascular complications include: cerebrovascular accident, cerebral infarct, stroke (both ischemic and hemorrhagic stroke), and transient ischemic attack.

3.7 Research Design

This is a cross-sectional study that utilized data that is part of the study: "An Assessment on Quality of Care among Patients Diagnosed with T2DM and Hypertension Visiting Ministry of Public Health and Bangkok Metropolitan Administration Hospitals in Thailand (Thailand DM/HT)" which was conducted in 2012.

3.8 Research Methodology

As this study was part of the large study of "An Assessment on Quality of Care among Patients Diagnosed with Type 2 Diabetes and Hypertension Visiting Ministry of Public Health and Bangkok Metropolitan Administration Hospitals in Thailand (Thailand DM/HT), according to the main study, the criteria were as follows.

3.8.1 Study area

All public hospitals under the Ministry of Public Health (MOPH) outside Bangkok and all hospitals and clinics participated in the Thailand National Health Security Office (NHSO)'s program within Bangkok formed the sampling frame. All T2DM patients visiting these hospitals in 2012 were eligible.

In Thailand, public hospitals under MOPH outside Bangkok are generally categorized into two types according to the level of care provided, via a community hospital (primary care level) and a regional or provincial hospital (secondary care level). The hospitals in Bangkok that accept NHSO's program composed of some public health hospitals, private hospitals and private clinics. According to the data from MOPH and NHSO's program, there were total 602 hospitals in Thailand in 2012.

3.8.2 Population and sample

Target population - Type 2 diabetes mellitus patients in Thailand

*Study popula*tion - All eligible type 2 diabetes patients visiting public Thailand Ministry of Public Health (MoPH) hospitals in Thailand including private clinics in the Thailand, National Health Security Office (NHSO)'s program in Bangkok during 2012.

3.8.3 Inclusion criteria for this study

- Type 2 diabetes patients aged 35 years old and older who received medical care in the targeted hospital for at least 12 months
- Type 2 diabetes patients with or without hypertension

3.8.4 Exclusion criteria for this study

- Patients who participated in any other clinical trial study

After evaluation the eligibility criteria, total 29,374 patients had T2DM with or without hypertension and among them, 1,728 had cardiovascular complications and 27,646 had no cardiovascular complications (Figure1).

3.8.5 Sampling method

According to the data form department of national statistics, there were 674,826 of diabetes patients in Thailand in 2012. In the main Thailand DM/HT study, a two-stage stratified cluster sampling with probability proportional to the hospital size according to number beds was used to select a nationally and provincially representative sample from the total diabetes population. The study was stratified sample drawn from the subset of all MoPH hospitals in Thailand including all public and private clinics in Bangkok under NHSO program. The first stage sampling was the province which constituted 77 strata and the second stage was the hospitals in each province. The hospitals in each province were then stratified into 5 strata by their sizes, i.e., regional center hospital (>500 beds), provincial general hospital (200 – 500 beds), large community hospital (90 – 120 beds), medium community hospital (60 beds), and small community hospital (10 – 30 beds).All of the university hospitals were not included in the study

3.8.6 Data collection method

In the Thailand DM/HT study, the required number of T2DM patients was given to clinics that provided medical care for T2DM patients. A standardized case report form was used to obtain the required information from medical records and sent to the Medical Research Network of the Consortium of Thai Medical Schools (MedResNet) central data management unit in Nonthaburi, Thailand. Data collection was done by participating hospital's authorized and well-trained personnel who had been trained to

protect the privacy of personal health information from unauthorized use, and deliberately engaged in the study.

For this study the data were maintained and available from the Diabetes and Hypertension Data Sharing center in the Data Archival for Maximum Utilization System (DAMUS) website developed by the Medical Research Foundation and operated by the Medical Research Network of the Consortium of Thai Medical Schools, Thailand. All the data were retrospectively collected from medical records. These included baseline information, status of diabetes, laboratory test results and medications. The data for each variable of laboratory test results, medication were verified by date, month, year and other variables were verified accordingly before data analysis.

3.8.7 Method of measurements

After receiving informed consent, known diabetic patients in each hospital were interviewed by the treating doctors according to the standard case record form and also assessed associated complications and co-morbidity by the physicians of each hospital.

Additionally, **blood pressure** was measured by a nurse, using a standard mercury sphygmomanometer.

Height was measured without shoes, and **weight** recorded while wearing indoor clothing. Body mass index (BMI) (weight in Kg, divided by height in meters squared) was calculated.

Fasting blood samples were taken to assess lipid profile, blood sugar and glycated hemoglobin (HbA1C) levels.

Urinary albumin concentration was measured by using immune chemical screening strips (Micral 11 ® test strips (Roche diagnostic GmbH Mannheim Germany were performed on first morning urine collections

Coronary artery complications were diagnosed using standard procedures. A standard 12 lead ECG was recorded for every patients. **MI** was identified by

symptoms of definite angina pectoris or of definite past myocardial infarction or ECG changes consistent with previous myocardial infarction.

Stroke was identified by asking to the patients about the previous history of stroke and confirmed by the physicians.

PVD was identified by physical examination and diagnosed as PVD when one or more foot pulses were judged absent, or if amputation and/or gangrene were present

3.8.8 Ethical consideration

The Thailand DM/HT study was approved by the Ethical Review Committee for Research in Human Subjects, Thailand Ministry of Public Health, and the Royal Thai Army Medical Department Ethical Review Board as well as local institutional review boards of local participated hospitals. The current study was approved to utilize the data of the Thailand DM/HT study by the committee of the Data Archival for Maximizing Utilization of Data (DAMUS) which can be access at http://www.damus.in.th and also approved by Faculty of Medicine, Chulalongkorn University ethic consideration board.

At each clinic, health care personnel, usually a registered nurse invited patients with the pre-existing diagnosis of T2DM in consecutive sequence to participate in the study. Before data collection, the patients were explained about the reasons, the benefits and the risks linked to this research and asked for the willingness to participate. Participants were invited to ask for any additional information and clarification they need and then invited to decide whether they want to participate to the research or not. It was clearly explained to them that if they decline to participate they would not suffer any adverse event. The same information was provided in written through the consent form and after they accepted to participate, they signed a written informed consent before collection of the data and accessing their medical records. They could also interrupt participating to the research at any moment and no questions were asked about the reasons for their interruption. Researcher assured them that the findings of this research helped them to address their needs and help for a quality assessment of medical care among Thai type 2 diabetes and or hypertension patients. The written informed consent contained the information which include confidentiality, free participation, freedom to withdraw and no use of data for other

purposes and assured anonymity. The name appeared in the consent form was not linked to the medical records and everything was kept confidential.

After collecting the data from medical records, all the data for each participant was kept in a personal computer with user name and password.
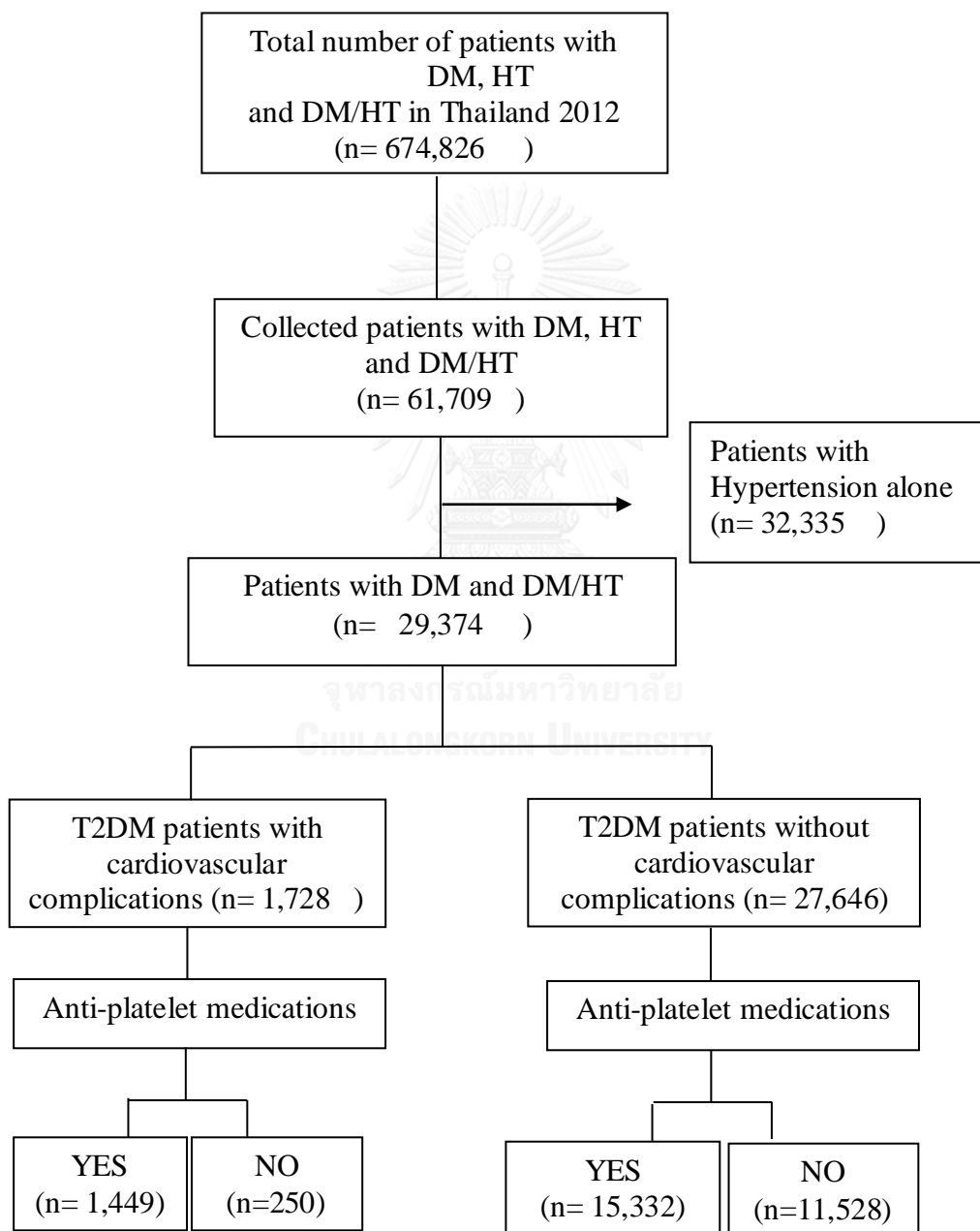


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┌─────────────────────────────┐
│  Total number of patients   │
│          with               │
│        DM, HT               │
│ and DM/HT in Thailand 2012  │
│      (n= 674,826    )       │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│ Collected patients with     │
│        DM, HT               │
│       and DM/HT             │
│      (n= 61,709  )          │────────────► ┌──────────────────────┐
└─────────────────────────────┘             │ Patients with        │
              │                              │ Hypertension alone   │
┌─────────────────────────────┐             │ (n= 32,335   )       │
│ Patients with DM and DM/HT  │             └──────────────────────┘
│      (n=  29,374    )       │
└─────────────────────────────┘
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T2DM patients with cardiovascular complications (n= 1,728)	T2DM patients without cardiovascular complications (n= 27,646)
Anti-platelet medications	Anti-platelet medications

YES (n= 1,449)	NO (n=250)	YES (n= 15,332)	NO (n=11,528)

Figure 1 Flow diagram of study population

3.8.9 Data Analysis

Characteristics of participants were described by using frequency and percentage for categorical data and the mean together with its standard deviation for continuous data. To find out the prevalence of cardiovascular complications, anti-platelet therapy used among Thai type2 diabetes patients, descriptive statistics was used in this study. Multiple logistic regression was used to evaluate the association between size of hospitals and anti-platelet therapy used among Thai T2DM patients with cardiovascular complications. Firstly, effects of the size of hospitals and other covariates on use of anti-platelet medications were examined using bivariate logistic regression. The crude odds ratios (OR) and their 95% confidence intervals (95%CI) were estimated. Effects of other variables and potential confounders on the outcome were also explored. These included gender, age, BMI, history of smoking and glycemic control. The initial model of multivariable analysis included the types of hospitals and all other variables which were found to be bio-sociologically important and that with p-value of bivariate analysis were 0.25 or less. Interaction effects between the types of hospitals and other significant covariates were also investigated. The adjusted OR, 95% CI, and p-value were reported. All analyses were performed using Stata version 13.0 (StataCorp, CollegeStation, TX).

CHAPTER IV
RESULTS

4.1 General characteristics and baseline data of Thai T2DM patients with cardiovascular complications in 2012

Table 1 show about the general characteristics of Thai T2DM patients with cardiovascular complications in 2012. Among total T2DM patients, 1,728 patients had any kind of cardiovascular complications. Among them, 39.2% were male and 69.8% were female. The mean age of patients was 59.8 years which is range from 20 to 97 years. The age was categorized into 4 sub-groups: "<40 years", "40-49 years", "50-59 years", and ">=60 years". About 76.3% of T2DM patients with cardiovascular complications were over 60 years of age. %) .In Thai T2DM patients with cardiovascular complications, 37% were housekeeper and employed person, 26.8% were farmers and 16.1% were day labors. About 38.2% of T2DM patients with cardiovascular complications were overweight patients with BMI and 16.2% of them had obesity. Almost all of patients (86.2%) were never smoke. Most of the T2DM patients with cardiovascular complications patients (48.9%) were from community hospital and among them 46% of patients were from hospitals within Bangkok. Among T2DM patients with cardiovascular complications, 40.3% were suffered from diabetes between 5 to 10 years, 33.5% had dyslipidemia, only 12.7% had hypertension and 24.2% had albuminuria.

Table 1 General characteristics and baseline data of Thai T2DM patients with
cardiovascular complications (n= 1,728)

Characteristics	Number(n)	Percentage (%)
Gender		
Male	678	39.2
Female	1050	60.8
Age in years		
<40	7	0.4
40-49	70	4.1
50-59	332	19.2
>=60	1,319	76.3
Mean=59.8, SD=10.8		
Median=60, Range=20-97		
BMI in kg/m2		
<18.5 (underweight)	39	2.6
18.5-24.99(normal)	645	43.1
25-29.99 (overweight)	571	38.2
>30 (obesity)	241	16.1
Mean=25.5 , SD=4.3		
Median= 25.2, Range=12.8-74.0		
Occupation		
Housekeeper or employed person	639	39.3
Farmer	463	28.5
Labor (include day labor)	279	17.2
Trader or Merchant	129	7.9
Retired Government Employee	53	3.4
Government Employee	39	2.4
Monk	15	0.9
State Enterprise Employee	4	0.2
Private Corporation Officer	4	0.2
History of smoking		
Never smoke	1271	86.2
Quit smoking	135	9.2
Continuous smoking	68	4.6
Size of hospitals		
Regional center hospital (>500 beds)	318	19.1
Provincial general hospital (200 – 500 beds)	533	32.0
Community hospital (10 – 120 beds)	814	48.9

Size of hospitals within Bangkok		
Public health hospitals	31	17.8
Bangkok	80	46.0
Private hospitals	47	27.0
Private clinics	16	9.2
Duration of diabetes		
<5	536	32.5
5-10	663	40.3
>10	448	27.2
Mean=6.7, SD=4.6		
Median=6, Range=0-54		
Dyslipidemia		
NO	531	66.5
YES	268	33.5
Hypertension		
NO	737	87.3
YES	107	12.7
Albuminuria		
NO(<20mg/dl)	1310	75.8
YES(>=20mg/dl)	418	24.2

4.2 Level of HbA1c and prescription of medications among Thai T2DM patient with cardiovascular complications

Table 2 shows the data on level of HbA1c, use of anti-diabetes medications and anti-platelet medications among Thai T2Dm patients with cardiovascular complications. According to the results, 62.2% of patients got the target glycemic level of HbA1c <=8%. Among the patients with cardiovascular complications, almost all of patients (90.8%) were prescribed by aspirin alone. As for the anti-diabetes medications, about 60.8% were on biguanides and 25.5% were on insulin and only 5.2% were on lifestyle modifications.

Table 2 Level of HbA1c and prescription of medications among Thai T2DM patient
with cardiovascular complications (n= 1,728)

Characteristics	Number(n)	Percentage (%)
HbA1c level		
<=8%	799	62.2
>8%	486	37.8
Mean=8.1, SD=2.0		
Median=7.6, Range= 3-20.5		
Anti-platelet medications		
Aspirin alone	1,316	90.8
Clopidogrel alone	68	4.7
Aspirin + Clopidogrel	65	4.5
Anti-diabetes medications		
Biguanides	1,047	60.8
Sulfonylurea	957	55.4
Non-sulfonyylurea	1	0.06
Thiazolidinedione	1	6.2
α glucosidase inhibitor	17	1.0
DPP4 inhibitor	24	1.4
GLP 1Analog	0	0
Insulin	441	25.5
Lifestyle modifications	90	5.2

4.3 Prevalence of cardiovascular complications in Thai T2DM patients in 2012 stratified by size of hospitals

Table 3 shows prevalence of different types of cardiovascular complications in Thai T2DM patients. According to this study, among 28,934 of T2DM patients, 5.9% (95%CI: 5.6 to 6.2) had at least one type of cardiovascular complications. Among that, 4 % (95%CI: 3.7 to 4.2) had coronary artery complications, 2% (95%CI: 1.8 to 2.2) had cerebrovascular complications and only 0.2 %(95%CI: 0.2 to 0.3) had peripheral vascular disease. When stratified by size of hospitals, patients from provincial general hospitals had more percentage for cardiovascular complications (8.2% : 95%CI: 7.5 to 8.8).

Table 3 Prevalence of cardiovascular complications in Thai T2DM patients in 2012
stratified by size of hospitals

Complications	Number	% of complication	95%CI	P value
Overall cardio vascular complications	**1,728**	**5.9**	**5.6-6.2**	**<0.001**
Coronary artery complications	**1,165**	**4.0**	**3.7-4.2**	**<0.001**
Myocardial infarct	728			
Congestive heart failure	286			
Angina pectoris	147			
Coronary revascularization	4			
Cerebrovascular complications	**593**	**2.0**	**1.8-2.2**	**<0.001**
Cerebro vascular accident	376			
Cerebral Infarct	68			
Ischemic stroke	53			
Hemorrhagic stroke	16			
Stroke (Not specify)	43			
Transient ischemic attack (TIA)	34			
Cerebral hemorrhage	3			
Peripheral Vascular Disease	**65**	**0.2**	**0.2-0.3**	**<0.001**
Size of hospitals				**<0.001**
Regional center hospital	318	7.0	6.2-7.7	
Provincial general hospital	533	8.2	7.5-8.8	
Community hospital	814	4.6	4.3-4.9	

95%CI = 95% confidence interval

4.4 Prevalence of anti-platelet therapy used among Thai T2DM patients with cardiovascular complications in 2012 (Secondary prevention)

Table 4 describes the prevalence of anti-platelet therapy used among Thai T2DM patients with cardiovascular complications. In this study, among T2DM patients with cardiovascular complications, total 1,184 patients, 84.8% (95%CI: 82.9 to 86.6) were prescribed by anti-platelet medications. Among them, 84.7 %(95%CI: 84.3 to 88.3) of coronary artery complications patients, 87.9% (95%CI: 83.8 to 92.1) of cerebrovascular complications patients and 73.7% (95%CI: 62.4 to 85.1) of peripheral vascular diseases patients were described by anti-platelet medications respectively. Among patients with coronary artery complications that were on anti-platelet medications, (85.0%, 77.7%, 88.9% and 84%) had angina pectoris, congestive heart failure, myocardial infarct and coronary revascularization respectively. In cerebrovascular complications group, 87.8% were from cerebral infarct, 85.8% were from ischemic stroke and   87.5% were from transient ischemic attack.

Table 4 Prevalence of anti-platelet therapy used among Thai T2DM patients with cardiovascular complications in 2012(Secondary prevention)

Complications	Total number (n=1,449)	% of drug used	95%CI	P value
Overall cardio vascular complications	**1,184**	**84.8**	**82.9-86.6**	**<0.001**
Coronary artery complications	**968**	**84.7**	**84.3-88.3**	**0.01**
Angina pectoris	119	85.0	79.0-91.0	0.02
Congestive heart failure	241	77.7	73.1-82.3	0.02
Myocardial infarct	647	88.9	84.8-89.2	0.01
Coronary revascularization	3	84.0	66.9-89.2	0.05
Cerebrovascular complications*	**211**	**87.9**	**83.8-92.1**	**0.02**
Cerebral Infarct	59	87.8	81.8-93.9	0.03
Ischemic stroke	45	85.8	79.5-92.2	0.03
Transient ischemic attack (TIA)	29	87.5	77.8-97.2	<0.001

Peripheral vascular disease	**45**	**73.7**	**62.4-85.1**	**0.05**

95% CI = 95% confidence interval

* In patients with cerebrovascular complications: cerebral hemorrhage and hemorrhagic stroke were not included as they are contraindication for anti-platelet medications

4.5 Factors associated with anti-platelet therapy used among Thai T2DM patients with cardiovascular complications in 2012 based on using binary logistic regression

Table 5 shows the associated factors of anti-platelet therapy used among Thai T2DM patients by using binary logistic regression. From that table, patients with cerebrovascular complications were 2.7 times more likely to be prescribed by anti-platelet therapy than those with coronary artery complications. (OR=2.7, 95%CI: 1.5 to 5.6). The older patients were more likely to be prescribed by anti-platelet therapy. i.e., patients aged of 60 years or greater were 2.5 times the odds of getting anti-platelet therapy comparing to those the age of less than 40 years,(OR=2.5, 95%CI: 0.5 to 13.8).

Table 5 Factors associated with anti-platelet therapy used among Thai T2DM patients
with cardiovascular complications in 2012 based on using binary logistic
regression

Characteristics	Number of drug used (n=1,449)	% of drug used	Crude OR	95%CI	P value
Size of hospitals					**<0.001**
Regional center hospital (>500 beds)	202	79.2			
Provincial general hospital (200 – 500 beds)	354	83.1	1.3	0.8-1.9	
Community hospital (10 – 120 beds)	590	88.2	1.9	1.3-2.3	
Types of cardiovascular complications					**0.01**
Peripheral vascular disease	45	71.4			
Coronary artery complications	933	84.7	2.3	1.3-4.0	
Cerebrovascular complications	206	87.2	2.7	1.5-5.6	
Gender					**0.2**
Male	469	86.2			
Female	715	83.8	0.8	0.6-1.1	
Age in years					**0.02**
<40	4	66.7			
40-49	41	87.2	3.4	0.5-22.9	
50-59	239	90.2	4.6	0.8-26.3	
>=60	900	83.4	2.5	0.5-13.8	
BMI in kg/m2					**0.2**
<18.5 (underweight)	22	91.7			
18.5-24.99(normal)	439	87.1	0.6	0.1-2.7	
25-29.99 (overweight)	397	83.1	0.4	0.1-1.9	
>30 (obesity)	183	87.1	0.6	0.1-2.8	
History of smoking					**0.4**
Never smoke	881	84.7			
Quit smoking	96	88.9	1.4	0.7-2.7	
Continuous smoking	47	83.9	0.9	0.5-2.0	

HbA1c					0.7
<=8 %	547	84.8			
>8%	350	85.6	1.1	0.7-1.5	

95%CI = 95% confidence interval

Crude OR = Crude odds ratio

4.6 Factors associated with anti-platelet therapy used among Thai T2DM patients with cardiovascular complications in 2012 based on using multiple logistic regressions

In multivariate analysis, after adjusting other factors, only three factors were associated with the use of anti-platelet medications in T2DM patients with cardiovascular complications as shown in table 6. Patients from community hospital were more likely to be prescribed by anti-platelet (OR =2.0, 95%CI: 1.3 to 2.9). Patients with coronary artery complications (OR=2.2, 95%CI: 1.2 to 3.9) and cerebrovascular complications (OR =3.0, 95%CI: 1.5 to 5.9) were more likely to be on anti-platelet therapy. But female patients with cardiovascular complications were 10% less likely to be on anti-platelet therapy than male patients (OR=0.9, 95%CI: 0.6 to 1.3).

Table 6 Factors associated with anti-platelet therapy used among Thai T2DM patients
with cardiovascular complications in 2012 based on using multiple logistic
regressions

Characteristics	Number of drug used (n=1449)	% of drug used	Adjusted OR	95% CI	P value
Size of hospitals					**<0.001**
Regional center hospital (>500 beds)	202	79.2			
Provincial general hospital	354	83.1	1.3	1.0-2.0	
Community hospital (10 – 120 beds)	590	88.2	2.0	1.3-2.9	
Types of cardiovascular complications					**<0.001**
Peripheral vascular disease	45	71.4			
Coronary artery complications	933	84.7	2.2	1.2-3.9	
Cerebrovascular complications	206	87.2	3.0	1.5-5.9	
Gender					**0.03**
Male	469	86.2			
Female	715	83.8	0.9	0.6-1.2	

95% CI = 95% confidence interval

Adjusted OR = Adjusted odds ratio

4.7 Percentage of anti-platelet therapy used among Thai T2DM patients without cardiovascular complications in 2012 (Primary prevention)

Table 7 describes the percentage of anti-platelet therapy used among Thai T2DM
patients without cardiovascular complications. According to this result, among total
T2DM patients in this study, 27,646 patients had no cardiovascular complications.
Among that, 58.2% (95%CI: 57.6 to 58.8) were prescribed by anti-platelet therapy.

Table 7 Percentage of anti-platelet therapy used among Thai T2DM patients without cardiovascular complications in 2012

Total number of patients with no cardiovascular complications (n= 27,646)	Number of drug used	% of drug used	95% CI	P value
No cardiovascular complications	15,332	57.1	56.5-57.7	<0.001

95%CI = 95% confidence interval

4.8 Factors associated with anti-platelet therapy used among Thai T2DM patients without cardiovascular complications in 2012 based on using binary logistic regression

Table 8 shows the associated factors of anti-platelet therapy used as primary prevention among Thai T2DM patients. From that table, patients from community hospital were 1.7 times more likely to be prescribed by anti-platelet therapy than those from regional center hospital. (OR=1.7, 95%CI: 1.4 to 2.1). High risks for cardiovascular complications such as male and older patients, present history with quit smoking and hypertensive patients were more likely to be prescribed by anti-platelet therapy as primary prevention.

Table 8 Factors associated with anti-platelet therapy used among Thai T2DM patients
without cardiovascular complications in 2012

Characteristics	Total number (n=15,332)	% of drug used	Crude OR	Adj OR	95% CI	P value
Size of hospitals						**<0.001**
Regional center hospital (>500 beds)	1,987	50.1				
Provincial general hospital (200 – 500 beds)	2,700	46.4	0.9	0.5	0.4-0.6	
Community hospital (10 – 120 beds)	10,381	63.0	1.7	1.7	1.4-2.1	
Gender						**<0.001**
Male	5,274	60.9				
Female	10,058	55.3	0.8	0.6	0.5-0.7	
Age in years						**<0.001**
<40	461	53.5				
40-49	2,070	52.1	0.9	4.6	3.0-7.1	
50-59	4,740	55.0	1.1	4.4	2.9-6.7	
>=60	8,060	60.1	1.3	4.1	2.7-6.1	
BMI in kg/m2						**<0.001**
<18.5 (underweight)	386	39.0				
18.5-24.99(normal)	6,474	60.0	2.3	4.3	3.3-5.6	
25-29.99 (overweight)	5,298	58.5	2.2	3.5	2.7-4.6	
>30 (obesity)	2,029	56.6	2.0	2.4	1.8-3.1	
History of smoking						**<0.001**
Never smoke	11,815	57.1				
Quit smoking	1,045	58.0	1.0	0.6	0.5-0.7	
Continuous smoking	636	50.9	0.7	0.2	0.2-0.3	
Hypertension						**<0.001**
NO	7,991	58.0				
YES	1,079	56.4	0.9	1.7	1.4-2.1	
Dyslipidemia						**0.004**
NO	4,953	57.0				
YES	2,432	59.8	1.1	0.8	0.7-0.9	

Albuminuria						**<0.001**
NO	10,382	56.7				
YES	4,949	57.8	1.1	0.8	0.7-0.9	

95%CI = 95% confidence interval

Crude OR = Crude odds ratio

Adjusted OR = Adjusted odds ratio

CHAPTER V

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 Discussion

Diabetes mellitus is a chronic condition and it can lead to long term complications overtime such as macro vascular and micro vascular complications. The impact of cardiovascular complications in T2DM patients on health-related quality of life, economic costs, morbidity and mortality is high (32, 33).There were many studies to find out the prevalence of cardiovascular complications. But most were in a single hospital with limited sample size. The present multi-center study was based on nationally represented sample over 602 hospitals across Thailand and this study found out the prevalence of cardiovascular complications and their anti-platelet therapy usage, stratified by the size of hospitals form all over the regions of Thailand. Therefore, the findings from this study can be expected to a large extent represent the prevalence of chronic complications and HbA1c level ranges of T2DM patients in Thailand.

5.1.1 General characteristics and baseline data of Thai T2DM patients with cardiovascular complications in 2012

The study subjects were those visited to public hospitals under Ministry of Public Health and those attended clinics and hospitals of Bangkok Metropolitan Administration. Among them most of the complicated patients were from community level hospitals. They represented the lower income population and most were wage-based workers which include house keepers, farmers and day-paid labors. Most of the T2DM patients with cardiovascular complications were female and more than 60 years of age with mean duration of 6.7 years. Most of the complicated patients got controlled for dyslipidemia as more than half of the patients were on ACEI during the last 12 month follow up period. Although this variable is not included in this study, there is the data recorded in the case record form about the medications of ACEI, so that this may be the reasons of getting controlled of dyslipidemia in these subjects. But for the hypertension and albuminuria, there is no recorded data for their

medications but they also got controlled for that high risks. So, from these results, it can say that, Thai T2DM patients with cardiovascular complications can control for the other risks factors like hypertension, dyslipidemia and albuminuria. But among these subjects, few were still smoking.

5.1.2 Level of HbA1c and prescription of medications among Thai T2DM patient with cardiovascular complications

In this study, more than half of patients got the target HBA1c level of <=8%.This shows that diabetes patients who had cardiovascular complications seem to get controlled of glycemic level. This can be explain that according to clinical practice and literature background, patients who already had chronic complications or other co morbidities can control their HbA1c level only with lifestyle modifications. Moreover, in this study, almost all of the patients with complications were on different types of anti-diabetes medications according to table 2 and so this seems one of the reason of those patients got controlled for their glycemic level. But the test of HbA1c can differ from lab to lab up to 20%, so the level is used for treatment plan rather than criterion to diagnose DM. However, the optimal HbA1c level for this study was <=8%.When finding with the target HbA1c level for <7%, about 40 % of patients got that target level. So, the loosen HbA1c level in this study may be another reason of good glycemic control level in complicated patients. But to know the better of glycemic control, the initial HbA1c level of should need to record in the questionnaire.

5.1.3 Prevalence of cardiovascular complications in Thai T2DM patients

Among total T2DM patients from this study, overall 5.9% (95% CI=5.6-6.2) were suffered from at least one type of cardiovascular complications. This result is better than the previous multi-center study of Zhaolan Liu in China (17) and lower than the previous study from Thailand(20). Among the overall cardiovascular complications, 4.0% had coronary artery complications, 2 % had cerebrovascular complications and only 0.2% had peripheral vascular disease. According to the study from Thailand disease registry project in tertiary care center, about 4 to 10% of

T2DM patients from tertiary care center had at least one type of cardiovascular complications and 0.7 to 34% in primary care center (34).In this study, the overall prevalence of cardiovascular complications from primary care level was 4.6% and those from secondary care level was between 7 to 8%. So this result conforms to the previous study (19).But according to this current study, higher prevalence of cardiovascular complications found in secondary care level than primary care level and also the overall prevalence of cardiovascular complications was still high.

5.1.4 Prevalence of anti-platelet therapy used among Thai T2DM patients with cardiovascular complications in 2012 (Secondary prevention)

Among total 1,728 patients with overall cardiovascular complications, 84.8% were prescribed by anti-platelet therapy mostly aspirin as secondary prevention, in comparison to 74% of those with cardiovascular disease in the study by Presell and Baker (35).But one of the study from Thailand reported that all of diabetes patients with cardiovascular complications were prescribed by aspirin as secondary prevention. Similarly, the UKPDS cohort study showed 76-82% of patients with cardiovascular disease were on aspirin medication (30).According to ADA guideline, all diabetes patients with a history of cardiovascular complications should use aspirin as secondary prevention and expected to use 90% (13).So, the prevalence of anti-platelet therapy used as secondary prevention was lower than the guideline in Thailand. But in this study, the other 213 patients (15.3% of total patients) with cardiovascular complications were not on anti-platelet therapy as secondary prevention. There were reasons of non-anti-platelet prescriptions that is 3 patients had GI bleeding, 2 of them had hemoptysis and 18 had diseases that are contraindicated to ant-platelet. The percentage of known contraindication was low (0.01%) of the eligible patients where most of these patients (0.11% of eligible) were without known reasons.

And also in this current study, the prevalence of anti-platelet therapy varied between 74 to 87 % for each cardiovascular disease depending on primary and secondary care level. When finding the prevalence of anti-platelet therapy in different types of cardiovascular complications, we observed that patients with myocardial infarction were more likely to be on antiplatelet therapy (88.9%) than those with a

peripheral vascular disease (73.7%) or cerebrovascular complications (87.9%). The extent to which stroke patients and their physicians avoid antiplatelet therapy due to risk of bleeding is not known. This lower use of antiplatelet therapy in stroke patients warrants improving anti-platelet regimens in this patient population. According to the clinical experience and literature background, the lower use of anti-platelet in peripheral vascular disease may be due to non-compliance of aspirin in peripheral vascular disease. And also the efficacy of anti-platelet drugs is variable in distinct patient populations and is dependent on the type and location of atherosclerotic disease. Because of these factors, the prevalence of anti-platelet used was lower than those with coronary artery disease and cerebrovascular disease.

5.1.5 Factors associated with anti-platelet therapy used among Thai T2DM patients with cardiovascular complications in 2012

The objective of exploring the factors associated with antiplatelet agent use in this study was to help identify subgroups that may be targeted for special efforts to increase antiplatelet therapy. We found that women, patients younger than 40 years, and those continuous smoking were less likely to be using antiplatelet therapy. On the other hand, male patients over 60 years with at least one type of cardiovascular complications were taking antiplatelet therapy. This high level of use among those at the highest risk shows the achievability of the ADA guideline (13).From this results, women be less likely to be receiving antiplatelet therapy. This can be explained as, the effects of aspirin may be different in men and women; a recent study of primary prevention of cardiovascular complications in almost 40,000 women over 45 years of age showed that, while stroke risk was lowered, myocardial infarction and overall cardiovascular mortality were not (36). And also physicians may be less enthusiastic about the evidence base supporting the use of antiplatelet therapy in women. For patients under age 65, physicians (and patients themselves) may not perceive the risk of cardiovascular complications at that age was not high enough to take antiplatelet therapy.

The present study showed that T2DM patients from community hospital (primary care level) were 1.9 times more likely to be prescribed by anti-platelet therapy than regional center hospital in Thailand. We also observer that there is an

association between types of cardiovascular disease and anti-platelet therapy used. Patients with cerebrovascular diseases (OR = 3.0, 95% CI: 1.5 to 5.9)　and also with coronary artery diseases (OR = 2.7, 95% CI: 1.2 to 3.9)　were more likely to be on anti-platelet therapy than those with peripheral vascular disease. This result conforms to the previous study (37). When trying to find the types of complications according to the size of hospitals, about half of the coronary artery complications patients were from primary care level. So, the anti-platelet prescription may high in primary care level. This may be one of the reasons of increase in prevalence of anti-platelet therapy used in primary care level. And in clinical practice, most of the patients went to the primary care level for follow up visit and they may also be prescribed by anti-platelet therapy from the secondary or tertiary level from their first visit. So that, the percentage of anti-platelet therapy used was high in the primary care level for secondary prevention.

5.1.6 Percentage of anti-platelet therapy used among Thai T2DM patients with no cardiovascular complications in 2012 (Primary prevention)

Current study reported that only 58.2% (95%CI=57.5 to 58.8) were prescribed by anti-platelet therapy as primary prevention in those T2DM patients with no cardiovascular complications. This study results was consistent with the previous study from Thailand in 2004 (31)But previous study was conducted only in one province. In this study, the percentage of those receiving anti-platelet varied greatly from the provincial general hospital (46.4%), regional center hospital (50.1%) and community hospital (63.0%) within and outside Bangkok. So that, the proportion of diabetes patients taking aspirin as primary prevention fell between 45- 65% and this shows that the use of anti-platelet was not in common practice for primary prevention in Thailand 2012.But according to the recorded data from the case record form, the left 42.8% were not on anti-platelet mediation because 228 patients had GI bleeding, 10 of them have bleeding ion other organs such as aplastic anemia, subarachnoid hemorrhage, etc. 123 patients have other diseases that cannot take aspirin because of increased risk for bleeding tendency　such as cirrhosis, hepatitis C infection, dyspepsia, peptic ulcer , gastric ulcer, sigmoid colon cancer, chronic dyspepsia and unspecified thalassemia But still the percentage of anti-platelet used for primary

prevention was still low. However, according to the literature background, the effect of aspirin used for primary prevention is still inconclusive and FDA also not recommends giving aspirin for all patients as primary prevention start from 2010.

5.1.7 Factors associated with anti-platelet therapy used among Thai T2DM patients with no cardiovascular complications in 2012

According to the results from this study, high risks patients including male and older patients with history of quit smoking and hypertensive patients were more likely to be prescribed by anti-platelet therapy as primary prevention. This shows that Thailand adhere to the ADA guideline for the use of aspirin as primary prevention. But in this study patients from community level were still more likely to be prescribed by anti-platelet as primary prevention than the regional center hospital. This shows the gap of treatment in the secondary care level.

5.1.8 Comments and discussion on the study using secondary source

This study was the first in Thailand that involved a large nationally representative sample of patients with T2DM that reported the data about the prevalence of chronic complications, glycemic control (HbA1c level) status and aspirin and/or clopidogrel prescriptions to T2DM patients in 2012 and also the consequential study from the effects of oral hypoglycemic agents, insulin and lifestyle modifications on glycemic control of T2DM patients in the year 2011 by the same author. From these experiences, dealing with secondary data can save time, save money, easy to access to data, and can give unexpected new discoveries and conclusions by reanalyzing the data. But there are some difficulties in data collection method as there are lacking of some information and inappropriateness of data to answer the research question. So, if the secondary data was used without checking for correctness and accuracy of each variable, it may provide misleading information. In the current study, each variable was verified by date, month and check for accuracy properly before analysis.

5.2 Conclusion

In conclusion, the overall prevalence of cardiovascular complications in Thai T2DM patients was 5.9% and among them, 84.8% were prescribed by anti-platelet medications as secondary prevention and 57.1% were prescribed as primary prevention. When stratified by size of hospital, primary care level was more likely to prescribe anti-platelet therapy both as primary and secondary prevention. Moreover, patients with cerebrovascular complications and male patients were more likely to be on anti-platelet therapy. Use of anti-platelet therapy as primary prevention was not in common practice in Thailand. Most of Thai T2DM patients with cardiovascular complications seem got controlled of their glycemic level, hypertension, dyslipidemia and albuminuria. As the overall prevalence of anti-platelet used as secondary prevention was 84.8%, it was below the ADA guideline.

For the limitation of this study, cannot get the on patients with more than two categories of complications concurrently. This study cannot also assess the severity of diabetes .Moreover, as this study will be the part of cross section study, it can only tell the association of aspirin by magnitude of effect. This study cannot give the information about the previous history taken of aspirin and clopidogrel and also cannot know whether the patients take the drugs properly or not. So, this study cannot tell the compliance of drugs and so the effects of drugs on cardiovascular complications cannot be concluded from this study. And also there was no data about the other symptomative treatment of these drugs to the patients. So this study cannot determine the relative risk and so cannot conclude whether aspirin can prevent cardiovascular complications or not. There is no recorded data for patients without cardiovascular complications and only recorded for no data available on cardiovascular complications. So cannot conclude for use of aspirin as primary prevention.   Although there were some limitations, this study provides the estimates prevalence of T2DM related cardiovascular complications and anti-platelet therapy used based on nationally representative sample size in different health care level of Thailand. Thus, the results are relevant for the health care personnel in Thailand for the prevention, management and treatment for cardiovascular complications and improve more room to give anti-platelet as secondary prevention in Thai T2DM patients.

5.3 Recommendation

Intensive preventive measures on health education including about life style modifications, risks of cardiovascular complications should be given in order to reduce cardiovascular complications in T2DM patients. Despite clinical practice guidelines recommending antiplatelet therapy for patients with diabetes, there are still eligible patients not receiving this beneficial therapy, particularly patients under 50, women, and patients without known cardiovascular diseases. Effective methods to increase antiplatelet use should be considered at the national, community, practice and provider level. The author would like to recommend improving the questionnaire for the future study by putting the purpose of giving aspirin, the initial HbA1c level, and drug compliance. Even though this study is cross-sectional, it was a widely national based study with larger sample size, so that the results from this study may be useful for further more clinical trials and other longitudinal study for anti-platelet therapy as preventive measures in cardiovascular complications among Thai T2DM patients.

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APPENDIX

APPENDIX

A Quality Assessment of medical care among patients with type 2 Diabetes and/or Hypertension at hospitals under Ministry of Public Health and Bangkok Metropolitan   Administration in Thailand in 2011-2012

Subject ID number ☐☐☐

Hospital ID number ☐☐-☐-☐☐

Follow up time

☐ 1. Check up on time

☐ 2. Not in check up on time

Type of clinic

☐ 1. Diabetic Clinic

☐ 2. Hypertension Clinic

☐ 3. Diabetic and Hypertension Clinic

☐ 4. General Medicine Clinic (Gen. Med.)

☐ 5. General Practice Clinic/ Family Medical Clinic/Social security clinic

☐ 6. Other Clinic, please specify ....

สปสช. **CRCN** ID number ☐☐☐☐ Hosp. number ☐☐-☐-☐☐

Part 1 General information (Item 1 - 9)

1 Gender ☐ 1.Male ☐ 2. Female

2 Age ☐☐ **years** *(birth year) (20-99 years)*

3 Occupational (present)

☐ 1. Farmer or farm worker ☐ 2. Government employee

☐ 3. Trader or Merchant ☐ 4. State Enterprise Employee

☐ 5. Private corporation officer ☐ 6. Labor (include day labors)

☐ 7. Student ☐ 8. Housekeeper or unemployed person

☐ 9. Self-Employed/Own Business ☐ 10. Monk/nun/priest

☐ 11. Retired Government employee ☐ 12. Other, please specify.........................

☐ 13. Data not available in the medical record

4 Religion

☐ 1. Buddhism ☐ 2. Islam ☐ 3. Christianity

☐ 4. Other please specified .... ☐ 5. Data not available in the medical record

5 Health care financing

☐ 1. Universal coverage scheme

☐ 2. Government or state enterprise officer

☐ 3. Social security scheme ☐ 4. State enterprise officer

☐ 5. Out of pocket ☐ 6. Other please specify ....

6 Present diagnosis *(choose only one answer)*

☐ 1. Only diabetes Mellitus (go to part 2 of questionnaires)

☐ 2. Only hypertension (go to part 3 of questionnaires)

☐ 3. Both diabetes mellitus and hypertension (go to part 2 and part 3 of questionnaires)

7 Recent weight ☐☐☐.☐ **Kg** ☐ Data not available in the medical record

8 Recent height ☐☐☐.☐ **Cm** ☐ Data not available in the medical record

9. Recent waist ☐☐☐.☐ **Cm** ☐ Data not available in the medical record

Site of waist

☐ 1. L4-L5 ☐ 2. L2-L3 ☐ 3.L1 ☐ 4. Data not available in the medical record

สปสช. **CRCN** ID number ☐☐☐☐ Hosp.Num. ☐☐-☐-☐☐

Part 2 Diabetes mellitus indicators (questions 9-35)

10. Duration of treatment in this hospital

☐ 1. ≥ 12 months ☐ 2. < 12 months (excluded from the study no further data collection)

11. Date diagnosis of DM was made in 25 ☐☐ ☐ Data not available in the medical record

12. Type of patient ☐ 1. Routine follow up treat at this hospital ☐ 2. Referral from PCU

13. Last follow up visit date (dd/mm/yyyy) ☐☐ / ☐☐ /255 ☐

14. Fasting plasma glucose test ;FPG (Not DTx) during the last 12-month follow up period

Lab test	Not done	Yes	Result	Test date (day/month/year)
1) Last test:	☐	☐	☐☐.☐ mg/dL	☐☐ / ☐☐ /255 ☐
2) Test before the last test	☐	☐	☐☐.☐ mmol/L	☐☐ / ☐☐ /255 ☐

15. Fasting capillary blood glucose test (DTx) during the last 12-month follow up period

☐☐☐ mg/dL date ☐☐ / ☐☐ /255 ☐ ☐ No, test was not done

16. Postprandial blood glucose test during the last 12-month follow up period

☐☐☐ mg/dL date ☐☐ / ☐☐ /255 ☐ ☐ No, test was not done

17. Laboratory test during the last 12-month follow up period

Lab test	Not done	Yes	Result	Test date (day/month/year)
17.1 Hb A1C	☐	☐	☐☐.☐ mg/dL	☐☐ / ☐☐ /255 ☐
17.2 Hemoglobin	☐	☐	☐☐.☐ mmol/L	☐☐ / ☐☐ /255 ☐
17.3 Serum BUN	☐	☐	☐☐.☐ mmol/L	☐☐ / ☐☐ /255 ☐
17.4 Serum Creatinine	☐	☐	☐☐.☐ mmol/L	☐☐ / ☐☐ /255 ☐
17.5 Serum Potassium	☐	☐	☐☐.☐ mmol/L	☐☐ / ☐☐ /255 ☐
17.6 Serum Uric Acid	☐	☐	☐☐.☐ mmol/L	☐☐ / ☐☐ /255 ☐
17.7 Total Cholesterol	☐	☐	☐☐☐☐ mmol/L	☐☐ / ☐☐ /255 ☐

สปสช. **CRCN** ID number ☐☐☐☐ Hosp.Num. ☐☐ - ☐ - ☐☐

17. Laboratory test during the last 12-month follow up period (continues)

Lab test	Not done	Yes	Result	Test date (day/month/year)
17.8 Triglyceride	☐	☐	☐☐☐☐ mg/dL	☐☐ / ☐☐ /255☐
17.9 HDL Cholesterol	☐	☐	☐☐☐☐ mmol/L	☐☐ / ☐☐ /255☐
17.10 LDL Cholesteral	☐	☐	☐☐☐☐ mmol/L	☐☐ / ☐☐ /255☐

Type of LDL-Cholesterol ☐ *Result cannot be calculate due to high level of serum* <u>*Triglyceride (TG ≥400)*</u>

☐ 1. Direct measurement (measured-*LDL* or Direct-*LDL*)

☐ 2. Calculated-*LDL*

☐ 3. Not known

| 17.11 Estimated GFR | ☐ | ☐ | ☐☐.☐ mmol/L | ☐☐ / ☐☐ /255☐ |

GFR calculation formula (choose only one answer)

☐ 1. Cockroft-Gault   ☐ 2. MDRD   ☐ 3. CKD-EPI 2009   ☐ 4. Not known

18. Blood pressure during the last 12-month follow up period

Blood pressure	Result (mmHg)	Test date (day/month/year)	Type of test
18.1 Last measurement result	☐☐☐ / ☐☐☐	☐☐ / ☐☐ /255☐	☐ 1.digital ☐ 2.manual ☐ 3.not known
18.2 Measurement before the last measurement	☐☐☐ / ☐☐☐	☐☐ / ☐☐ /255☐	☐ 1.digital ☐ 2.manual ☐ 3.not known

19. Anticoagulant medication during the last 12-month follow up period

☐ 1. No medication; reason

　☐ 1.1 GI bleeding   ☐ 1.2 Bleeding in other organ, please specified ....

　☐ 1.3 Other, please specified...................   ☐ 1.4 Data not available in the medical record

☐ 2. Yes, last prescribed date (dd/mm/yyyy) ☐☐ / ☐☐ /255☐

　　Drug name (choose only one answer) was

　　☐ 2.1 only aspirin ☐ 2.2 only clopidogrel (Plavix®, Pidogen®, Apolets®)

　　☐ 2.3 both aspirin and clopidogrel

สปสช. **CRCN** ID number ☐☐☐☐ Hosp.Num. ☐☐☐-☐-☐☐

20.Acute complication of diabetes mellitus during the last 12-month follow up period

☐1. No acute complication of diabetes mellitus

☐2.Yes, acute complication (s) was/were *(can be more than one complications)*

Complication of diabetes mellitus	Admit	No Admit	No data available
☐2.1 Hypoglycemia	☐	☐	☐
☐2.2 Hyperglycemia ,diabetic ketoacidosis; DKA	☐	☐	☐
☐2.3 Hyperglycemia ,hyperosmolar non-ketotic hyperglycemic syndrome; HNHS	☐	☐	☐
☐2.4 Hyperglycemia, not specified	☐	☐	☐

21.Urin Albumin or protein test during the last 12-month follow up period

☐1. No, test was not done or data not available in the medical record

☐2. No, test was not done; the patient has been diagnosed, diabetic nephropathy; DN

☐3. Yes ; the patient has been diagnosed Urinary tract infection

☐4. Yes, *(depend on local laboratory)* ,

last test date ☐☐ / ☐☐ /255☐   *If yes, please specified (check it all apply)*

☐4.2 *Urine dipstick/UA: result*   ☐1. Negative   ☐2. positive *(Macroproteinuria)*

☐4.2 *Microalbuminuria dipstick*:result   ☐1. Negative   ☐2. positive *(≥20 mg/L)*

☐4.3 *Morning urine for Alb/Cr Ratio: result* ☐1. < 30 mg/g   ☐2. 30 - 299 mg/g   ☐3. ≥300 mg/g

☐4.4 *Urine Albumin*   ☐☐☐☐.☐☐ mg/L (mg%) or

☐☐☐☐.☐☐ to ☐☐☐☐.☐☐ g/L

☐☐☐☐.☐☐ to ☐☐☐☐.☐☐ mg/24 hrs

22.Has the patient diagnosed Diabetic Nephropathy (DN) during the last 12-month follow up period

☐1. Yes   ☐ 1. during the last 12-month follow up period

☐ 2. More than 12-month follow up period

What was examination method ☐1.data available in medical record ☐1.result from lab test

☐2. No

☐3. Data not available in the medical record

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23. ACEI or ARB medication during the last 12-month follow up period

☐ 1. No; reason *(check all that apply)*

    ☐ 1.1 Stop medication; bad cough   ☐ 1.2 Creatinine > 3 mg/dL

    ☐ 1.3 Hyperkalemia (K > 5.0 mmol/L)   ☐ 1.4 Creatinine rising

    ☐ 1.5 Other please specify................ ☐ 1.6 Data not available in the medical record

☐ 2. Yes, last prescribed date (dd/mm/yyyy) ☐☐ / ☐☐ / 255 ☐

24. Visual Acuity: VA during the last 12-month follow up period

☐ 1. Data not available in the medical record

☐ 2. Not done

☐ 3. Yes, last examination date (dd/mm/yyyy) ☐☐ / ☐☐ / 255 ☐

    If yes; check it all apply

examination method	Measure	Right eye	Left eye
3.1 VA without correction	☐ 1.feet ☐ 2.meters	☐☐ / ☐☐	☐☐ / ☐☐
3.2 VA with correction	☐ 1.feet ☐ 2.meters	☐☐ / ☐☐	☐☐ / ☐☐
3.3 VA with pinhole	☐ 1.feet ☐ 2.meters	☐☐ / ☐☐	☐☐ / ☐☐
3.4 VA result test; please specify	☐ Counting finger;FC	☐☐ Feet	☐☐ Feet
	☐ Hand movement; HM	☐	☐
	☐ Projection of light;PJ	☐	☐
	☐ Perception of light; PL	☐	☐
	☐ No light perception;No PL	☐	☐

25. Full ophthalmoscopy during the last 12-month follow up period

☐ 1. Data not available in the medical record

☐ 2. Not done

☐ 3. Yes, last examination date (dd/mm/yyyy) ☐☐ / ☐☐ / 255 ☐

    What was examination method

    ☐ 1. Ophthalmoscopy by ophthalmologist

    ☐ 2. Fundus photography by well trained health care personal *(Nurse / specialist)*
confirmation by

        ☐ 2.1 Sent to ophthalmologist for review ☐ 2.2 No/Not known/No report

A Quality Assessment of medical care among patients with type 2 Diabetes and/or Hypertension at hospitals under Ministry of Public Health and Bangkok Metropolitan Administration in Thailand in 2011-2012

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สำนักงานหลักประกันสุขภาพแห่งชาติ

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26. **Has the patients been diagnosed diabetic retinopathy;DR by physician during the last 12-month follow up period**

☐ 1. **No,** *(include normal fundus photograph performed by a well trained health care personal)*

☐ 2. **Yes,** *(diagnosis must be confirmed by a physician only (check it all apply)*

   ☐ 2.1 **Non-pro**liferative diabetic retinopathy *(NPDR)*

   ☐ 2.2 **Pro**liferative diabetic retinopathy *(PDR)*

   ☐ 2.3 Diabetic macular edema

   ☐ 2.4 Not know or do not specify

☐ 3. Data not available in the medical record

27. **Oral examination by dentist or well trained health care personal during the last 12-month follow up period**

☐ 1. Data not available in the medical record

☐ 2. Not done

☐ 3. Yes, last examination date (dd/mm/yyyy) ☐ ☐ / ☐ ☐ /255☐

28. **Foot examination during the last 12-month follow up period**

1) *foot skin examination*	☐ 1. No	☐ 2. Yes; examination date ☐ ☐ / ☐ ☐ /255☐
foot ulcer	☐ 1. Normal, no ulcer	☐ 2. Abnormal *(inflammation/ swelling/ dry gangrene)*
2) *foot deformities*	☐ 1. No	☐ 2. Yes; examination date ☐ ☐ / ☐ ☐ /255☐
result	☐ 1. Normal	☐ 2. Any Foot deformities
3) *foot sensory testing*	☐ 1. No	☐ 2. Yes; examination date ☐ ☐ / ☐ ☐ /255☐
result	☐ 1. Normal	☐ 2. Any neuropathy
4) *Peripheral vascular examination*	☐ 1. No	☐ 2. Yes; examination date ☐ ☐ / ☐ ☐ /255☐
result	☐ 1. Normal	☐ 2. Abnormal, no pulse at least one peripheral artery

29. **Self-foot care education for patient / family during the last 12-month follow up period**

☐ 1. No   ☐ 2. Yes, education date ☐ ☐ / ☐ ☐ /255☐

30. **Toe/foot/leg amputation during the last 12-month follow up period**

☐ 1. No *(go to question 32)*   ☐ 2. Yes

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ID number [ ][ ][ ][ ] **Hosp.number** [ ][ ]-[ ]-[ ][ ]

31. If yes, site of Amputation during the last 12-month follow up period *(check all that apply)*

    ☐ 1. Toe   ☐ 2. Foot

    ☐ 3. Below Knee (BKA)   ☐ 4. Above Knee (AKA)

32. Smoking, during the last 12-month follow up period

    ☐ 1. Continuous smoking   ☐ 2. Quit smoking *(go to question 34)*

    ☐ 3. Never smoke *(go to question 34)*   ☐ 4. No data available *(go to question 34)*

33. Smoking counseling_ or smoking cessation program during the last 12-month follow up period

    ☐ 1. No / No data available

    ☐ 2. Yes, counseling program start date (day/month/year) [ ][ ]/[ ][ ]/255[ ]

    By   ☐ 1. Nurses/clinician   ☐ 2. Psychologist / Almoner

             ☐ 3. Well trained health care personal   ☐ 4. Not known

34. Type of treatment, during the last 12-month follow up period (can be more than one type of treatment)

    ☐ 1. Biguanides

    ☐ 2. Sulfonylurea

    ☐ 3. Non – Sulfonylurea

    ☐ 4. Thiazolidinedione

    ☐ 5. Alpha – glucosidase Inhibitor (α–Gl)

    ☐ 6. DPP – 4 Inhibitor

    ☐ 7. GLP – 1 Analog

    ☐ 8. Insulin

    ☐ 9. Not received (diet, lose weight, exercise)

    ☐ 10. Other, please specify……………………………………

    ☐ 11. No data available in the medical record

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35. Chronic complication of diabetes mellitus during the last 12-month follow up period

Chronic complication of Diabetes Mellitus	Yes, Within 12 months	Yes, > 12 months	No data available in medical record	Not Known
1. Cerebrovascular Accident; *CVA*	☐	☐	☐	
2. Cerebral Infarction	☐	☐	☐	
3. Ischemic *Stroke*	☐	☐	☐	
4. Hemorrhagic *Stroke*	☐	☐	☐	
5. Stroke, Not specify	☐	☐	☐	
6. Cerebral Hemorrhage	☐	☐	☐	
7. Transient Ischemic Attack; *TIA*	☐	☐	☐	
8. Angina pectoris	☐	☐	☐	
9. Congestive Heart Failure; *CHF*	☐	☐	☐	
10. Myocardial Infarction; *MI* icluded Ischemic Heart Disease; *IHD*	☐	☐	☐	
11. Coronary Revascularization	☐	☐	☐	
12. Peripheral Arterial Disease, PAD	☐	☐	☐	
13. Neuropathy (Painfule neuropathy, Autonomic neuropathy,neurogenic bladder)	☐	☐	☐	
14. Renal Insufficiency (CRI, CRF, CKD, ESRD)	☐	☐	☐	☐
15. Diabetic Nephropathy, DN (form question 21 to question 22)	☐	☐	☐	☐
16. Diabetic Retinopathy; DN (form question 26)	☐	☐	☐	☐
17. Other complication, please specify…………………………	☐	☐	☐	☐

VITA

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WORK EXPERIENCE

1.   Medical Officer at Kant Kaw Specialist Private Hospital, Mandalay, Myanmar (March, 2011 – March 2013)

2.   Volunteer Medical doctor and Counselor at OPD (HIV/AIDS and opportunistic infections) at Sao San Htun Government General Hospital, Taunggyi, Myanmar (May, 2010 – July, 2010)

3.   Part time volunteer nurse teacher at Sao San Htun Government General Hospital and Women and Children Hospital, Taunggyi, Shan State, Myanmar (January, 2010 – December, 2010)

4.   One year medical internship at Sao San Htun Government General Hospital and Women and Children Hospital, Taunggyi, Shan State, Myanmar (January, 2010 – December, 2010)

Ongoing paper to be published

1. Association between oral hypoglycemic agents, insulin and lifestyle modifications on glycemic control of type 2 diabetes mellitus patients in Thailand:National survey 2011