A STUDY OF RISK FACTORS FOR CARDIOVASCULAR DISEASE IN PEOPLE IN A PROVINCE IN SOUTHERN PART OF THAILAND

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A STUDY OF RISK FACTORS FOR CARDIOVASCULAR DISEASE IN PEOPLE IN A PROVINCE IN SOUTHERN PART OF THAILAND

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ABSTRACT

Cardiovascular disease has become a major health problem in Thailand. Individuals with different ethnicities and religions have different cultures and lifestyles, which may eventually result in differences in the levels of cardiovascular risk factors. This cross-sectional study aimed to compare risk factors for cardiovascular disease between Islamic and non-Islamic Thai people living in the lower southern part of Thailand. Islamic and non-Islamic Thai adults aged 35 years or older who lived in Yaha district, Yala province, were randomly selected and invited to participate in the study, with the ratio of Islamic to non-Islamic participants being 2:1. Data were obtained from each participant by means of a self-administered questionnaire, physical examination and blood tests after overnight fasting. Comparisons of categorical variables between groups were carried out using the chi-square test. Continuous variables were compared using independent t-test or Mann-Whitney U test as appropriate.

Four hundred and five subjects, 270 Islamics and 135 non Islamics, participated in the study. Forty-six percent were male, and the median age of the participants was 52 years old (interquartile range 44 to 61). Subjects in the Islamic group had significantly higher proportion of diabetes mellitus compared to those in the non-Islamic group [37.4% vs. 23.7%, prevalence rate ratio (PRR) 1.57, 95% confidence interval (CI) of PRR 1.12 to 2.21, $p = 0.006$]. Median waist circumference was also greater in the Islamic group than in the non-Islamic group in both sexes (87.0 cm vs. 84.5 cm in males, $p = 0.011$; 85.0 cm vs. 80.0 cm in females, $p = 0.028$). There were no statistically significant differences between the 2 groups with regards to systolic and diastolic blood pressures, presence of hypertension, fasting plasma glucose, lipid profiles, body mass index, and presence of the metabolic syndrome, levels of physical activities, smoking status, and presence of multiple risk factors.

In conclusion, Islamic Thai adults in the lower southern part of Thailand have higher prevalence of diabetes mellitus and greater waist circumference compared to non-Islamic counterparts. Whether these differences translate into differences in the risks of cardiovascular disease needs to be studied further.

KEY WORDS: CARDIOVASCULAR DISEASE / CARDIOVASCULAR RISK FACTORS / ISLAM / SOUTHERN THAILAND

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การศึกษาเปรียบเทียบปัจจัยเสี่ยงโรคหัวใจและหลอดเลือดระหว่างคนไทยนับถือศาสนาอิสลามกับคนไทยที่ไม่ได้นับถือศาสนาอิสลามในจังหวัดยะลา

A STUDY OF RISK FACTORS FOR CARDIOVASCULAR DISEASE IN PEOPLE IN A PROVINCE IN SOUTHERN PART OF THAILAND

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บทคัดย่อ

โรคหัวใจและหลอดเลือดเป็นปัญหาทางสาธารณสุขที่สำคัญของประเทศไทย ประชาชนต่างเชื้อชาติและศาสนามีวัฒนธรรมและวิถีชีวิตที่แตกต่างกัน ซึ่งอาจส่งผลทำให้มีปัจจัยเสี่ยงต่อโรคหัวใจและหลอดเลือดที่แตกต่างกันได้ การศึกษาวิจัยแบบภาคตัดขวางเชิงวิเคราะห์นี้ มีวัตถุประสงค์เพื่อเปรียบเทียบปัจจัยเสี่ยงต่อโรคหัวใจและหลอดเลือดระหว่างคนไทยที่นับถือศาสนาอิสลามกับคนไทยที่ไม่ได้นับถือศาสนาอิสลามในจังหวัดหนึ่งในภาคใต้ตอนล่างของประเทศไทย กลุ่มตัวอย่างที่ศึกษาได้แก่คนไทยที่มีอายุ 35 ปีขึ้นไป ซึ่งอาศัยอยู่ในพื้นที่อำเภอยะหา จังหวัดยะลา โดยสุ่มเลือกตัวอย่างให้มีอัตราส่วนคนไทยที่นับถือศาสนาอิสลามต่อคนไทยที่ไม่ได้นับถือศาสนาอิสลามเท่ากับ 2:1 การเก็บข้อมูลวิจัยใช้แบบสัมภาษณ์ การตรวจร่างกาย และการตรวจเลือดภายหลังการงดอาหารในช่วงกลางคืน การเปรียบเทียบตัวแปรเชิงคุณภาพใช้การทดสอบChi-square ส่วนการเปรียบเทียบตัวแปรเชิงปริมาณใช้การทดสอบindependent t หรือการทดสอบMann-Whitney U ตามความเหมาะสม

อาสาสมัครที่เข้าร่วมการศึกษานี้มีทั้งหมด 405 คน เป็นกลุ่มคนไทยที่นับถือศาสนาอิสลาม 270 คน และกลุ่มคนไทยที่ไม่ได้นับถือศาสนาอิสลาม 135 คน กลุ่มตัวอย่างร้อยละ 46 เป็นเพศชาย และมีค่ามัธยฐานของอายุเท่ากับ52 ปี (พิสัยระหว่างควอร์ไทล์44-61ปี) พบว่ากลุ่มคนไทยที่นับถือศาสนาอิสลามมีความชุกของโรคเบาหวานมากกว่ากลุ่มคนไทยที่ไม่ได้นับถือศาสนาอิสลามอย่างมีนัยสำคัญทางสถิติ [ร้อยละ 37.4 เปรียบเทียบกับร้อยละ23.7, อัตราส่วนความชุก (prevalence rate ratio) 1.57, ช่วงความเชื่อมั่น 95%1.12-2.21, p = 0.006] และเส้นรอบเอวในกลุ่มคนไทยที่นับถือศาสนาอิสลามมีขนาดใหญ่กว่ากลุ่มคนไทยที่ไม่ได้นับถือศาสนาอิสลามทั้งเพศชายและหญิง(ค่ามัธยฐานเส้นรอบเอวเพศชาย 87.0 เซนติเมตรเปรียบเทียบกับ 84.5เซนติเมตร, p = 0.011; เพศหญิง 85.0 เซนติเมตรเปรียบเทียบกับ 80.0เซนติเมตร, p = 0.028) ส่วนปัจจัยเสี่ยงที่ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติระหว่างกลุ่มคนไทยที่นับถือศาสนาอิสลามกับคนไทยที่ไม่ได้นับถือศาสนาอิสลามได้แก่ ค่าความดันโลหิตช่วงหัวใจบีบตัวและคลายตัว,โรคความดันโลหิตสูง,ระดับน้ำตาลในเลือด,ระดับไขมันในเลือด,ดัชนีมวลกาย,กลุ่มอาการเมตะโบลิก,ระดับการออกกำลังกาย, การสูบบุหรี่, และการมีปัจจัยเสี่ยงต่อโรคหัวใจและหลอดเลือดหลายปัจจัย

โดยสรุป การศึกษานี้พบว่าคนไทยที่นับถือศาสนาอิสลามที่อาศัยในพื้นที่ภาคใต้ตอนล่างของประเทศไทยมีความชุกของโรคเบาหวานมากกว่าและมีขนาดเส้นรอบเอวใหญ่กว่าคนไทยที่ไม่ได้นับถือศาสนาอิสลามที่อาศัยอยู่ในพื้นที่เดียวกัน ความแตกต่างนี้จะนำไปสู่ความเสี่ยงของโรคหัวใจและหลอดเลือดที่แตกต่างกันในประชากรทั้ง 2 กลุ่มหรือไม่ จะต้องศึกษาเพิ่มเติมต่อไป

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CHAPTER I
INTRODUCTION

Rationale and Background

The management of chronic non-communicable diseases is given a light of attention by the globe at large nowadays. The change of living conditions and lifestyles has consequently resulted in the increasing number of this group of patients [1].world Health statistics in 2010 reported that one tenth of adult population was diabetes and one third among them also had hypertension. Moreover, cardiovascular disease caused about 17 million deaths each year globally [2]. World Health Organization also predicted the growing tendency of death due to cardiovascular disease to increase more in 2015 up to approximately 20 million people worldwide, 80% of which are reported to be from low and middle income countries [3].

During the past decades, several large epidemiological cohort studies, such as the Framingham Heart Study and the Seven Countries Study, had been conducted and had revealed various risk factors associated with cardiovascular disease [4]. In Thailand, prospective cohort studies also confirmed the association between these risk factors and cardiovascular events. However, the studies were done in a limited group of population and did not generation and not generalize to all regions [5].

It is observable that the health condition of Thai people in this decade is in the state of epidemiologic transition. The change is noticeable in types of health problems. Infectious diseases with high rate of morbidity and mortality such as diarrhea and pneumonia, which have been major health problems previously, have been better controlled whereas non-communicable disease such as cardiovascular disease, cancers, and accidents have been increasing [5]. The burden of disease index from the survey on health condition of Thai population discovered that the trends of non-communicable diseases are likely to increase in the future. Among the most problematic non-communicable disease are cardiovascular disease, cancers, respiratory disease and diabetes each year, each the average of 236 cases per day [6]. Such

number of deaths was, however, merely a portion of total existing patient at risk. Therefore, it is highly recommended that under constant medical treatment, otherwise they may experience cardiovascular complications which may result in disability or death. In some developed countries, 58 percent of stroke patients died or become disabled and consequently become a burden to their family members and the society [7].

Currently, cardiovascular diseases such as hypertension, ischemic heart disease, and stroke are still a major public health problem and the leading causes of morbidity and mortality among Thai population. Patient admitted to a public health center managed by the Ministry of Public Health from 2008 and 2012 comparing to the last 5 years of all 4 diseases the morbidity rate per 100,000 found that hypertension had raised from 659.6 to 1,349.4. Ischemic heart disease increased from 232.7 to 397.2 and stroke increased from 188.3 to 307.9 [7]. There has been a trend of increasing mortality rates due to cardiovascular diseases. According to the public health statistic of Thailand, the death rate per 100,000 due to hypertension increased from 3.9 in 2008 to 5.7 in 2012. The figures were 21.2 to 23.5 for ischemic heart disease, and 20.8 to 31.7 for stroke during the same period [8]. It also found the male patient death rate than female patients [9].

These diseases shoe a rapid growth and consequently result in economic loss both directly and indirectly. Such loss include the medical expense for treatments, In addition, they also cause the burden to the family members who take care of the patients which could eventually affect their career, source of income and quality of life [6].

In Yala a province in the southern part of Thailand, the morbidity rates due to cardiovascular disease is also increasing. According to the health statistics between 2007 and 2012 in Yala, the morbidity rate per 100,000 due to hypertension increased from 66-1,272 (Figure 1.1). For diabetes, the rate increased from 461 to 723 during the same period. The figures for stroke were 187 increasing to 254 and for ischemic heart disease from 264 increasing to 450 (Figure 1.1) [10]. As cardiovascular disease have a significant impact on population health and economic burden to the society, it is therefore important to have effective measures for prevention and control of these diseases.

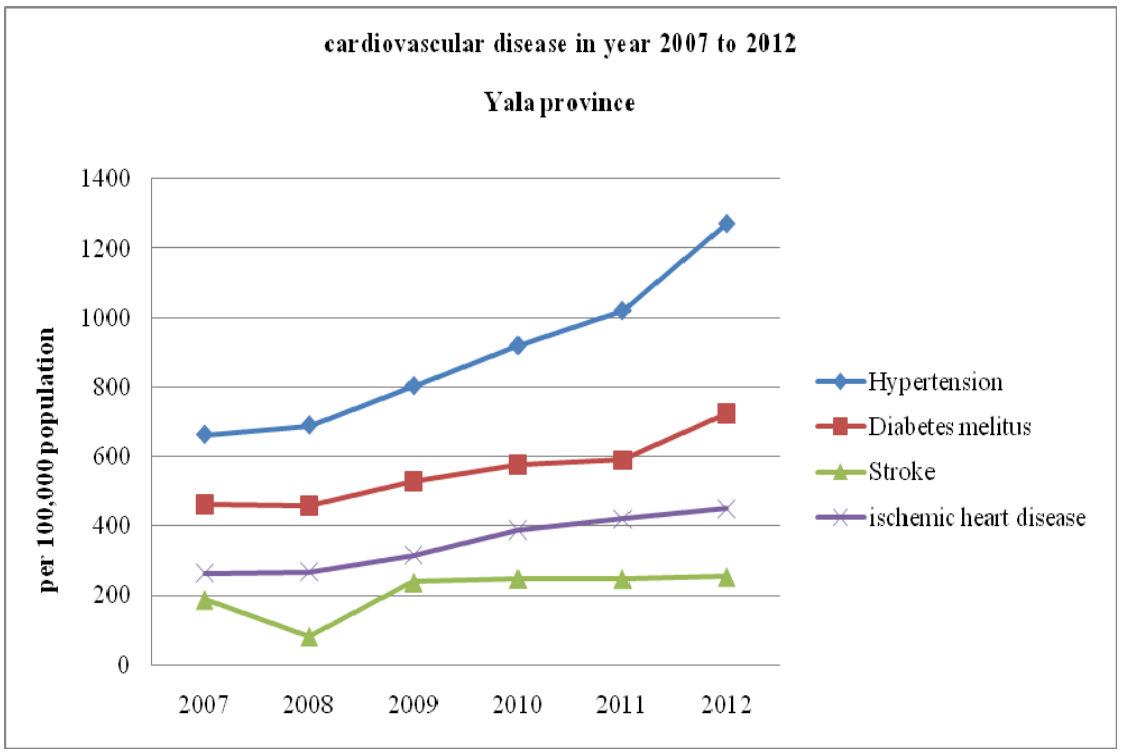

Figure 1.1: The morbidity rates due to cardiovascular disease in Yala province.
Source: Yala provincial public health office, Non- communicable disease

Yala is a province in southern Thailand which borders Malaysia. It consists of 8 districts. About 75% of the people in Yala are Muslims, about 25%. Buddhists and a negligible proportion practice other religions [10]. Muslim people in this province hold strong onto their unique culture and Islamic identify. Their way of life outstandingly, costumes, food, traditions and cult, rituals and arts, traditional plays, and local intellect. The majority of Yala people use local Malay language as their medium of communication. Although the customs and cultures of the people in each district are not much different from one another, their daily lifestyles that are portrayed through regular practices and habits such as exercise, food, and smoking are different from religion to religion [11]. Songkhla, another province bordering Malaysia, studies showed that Muslim people had lower HDL-cholesterol than Buddhists [12, 13] and female Muslims had higher prevalence of hypertension than female Buddhists [13]. Consequently, the risk of cardiovascular disease may be different in people with different religions.

This epidemiological research aimed to study the prevalence of risk factors for cardiovascular disease and compared them between Islamic and non-Islamic Thai people living in the same areas in Yala province. The data obtained would serve as basic information that could be useful for providing health care services that are suitable for people of different religions.

Research question

Do Islamic and Non-Islamic Thai people have different risk factors for cardiovascular diseases?

Research Objectives

To compare risk factors for cardiovascular disease including hypertension, diabetes, the metabolic syndrome, body mass index, waist circumference, lipid profiles, lack of exercise, and smoking, between Islamic and non-Islamic Thai people living in Yala province.

Research Hypotheses

Islamic and non-Islamic Thai people have different risk factors for cardiovascular disease.

Expected Research result

To identify the risk factors for cardiovascular disease in Islamic and non-Islamic Thais aged 35 years or older, and to determine if there is any difference between religion regarding these risk factors.

CHAPTER II
LITERATURE REVIEW

The study of the risk factors for cardiovascular disease in people in a province in southern part of Thailand. The study divided in to Islamic Thais and non-Islamic Thais people in Yala province. Related literatures have been reviewed and are presented in this chapter as follows:

2.1 Cardiovascular disease

2.1.1 Risk factors of cardiovascular disease

(1) Diabetes

(2) Hypertension

(3) Lipid profile

(4) Body mass index (BMI)

(5) Waist circumference

(6) Metabolic syndrome

(7) Lack exercise

(8) Smoking

2.1.2 Society, culture and health behavior are risks to be cardiovascular disease for Islamic Thais and non-Islamic Thais people in Yala province

2.1.3 Related literature

2.1 Cardiovascular disease

Symptoms of Cardiovascular disease caused by arteriosclerosis which results from the accumulated fat, protein, minerals in the blood vessel walls until they are blocked and narrow. It is the resistance of the blood flow, lack of vascular flexibility and fragility that if this happen to the arteries to the heart it will decrease the blood flow to the heart could cause ischemic heart disease. Blockage of blood vessels

can cause heart attack, heart failure or myocardial infarction. If it happens in vessels which supply blood to the brain it can cause paralysis [14].

Blood Vessels disease, either stroke or coronary artery disease and other types of blood vessel diseases are the cause of a significant death rate in the worldwide population. Blood vessel research in America shows that coronary artery disease (CAD) at 54% is the most frequent cause of death. Cerebrovascular disease or stroke at 18% is second [14]. However the number of patients who lose their life by Stroke tends to increase rapidly because worldwide population continues to increase, as does the elderly population and more patients are in the developing country. There are predictions that the death rate of patients who die from stroke will be 2 times more when compared with year 1990 and 2020 because the groups of the developing countries will increase their death rate from stroke more than developed countries [16]. For Thailand the death rate trend of cardiovascular disease from year 2006 is 3.89% and in year 2012 is 5.98% which indicates an increasing trend [17].

Coronary Artery Disease, CAD or Ischemic Heart Disease, IHD are conditions where the coronary artery becomes narrow or blocked due to decreased blood flow in the cardiac muscle, due to lack of demand[17]. Which mainly caused by fat and tissue accumulated in artery wall that has effect inner endothelial cell thickness. Patients exhibit symptoms when artery blockage is 50% or more. The most common symptoms are chest pain, palpitations, sweating, exertion, faint and unconsciousness which may lead to sudden death. These can be divided into 2 groups: stable angina and acute coronary syndrome.

Stable angina or chronic Stable Angina indicates symptoms of chronic ischemic heart disease. The patients feel tightness around the chest symptom comes and goes [18].

Acute coronary syndrome, ACS refers to a group of conditions caused by a decreased blood flow in the coronary arteries. The symptoms are composed of the main syndrome sudden pain around the chest. If during rest angina longer than 20 minutes it is getting more serious .There are 2 types[19] follows:-

1. ST elevation is symptom of acute coronary syndrome; ACS indicates ischemic heart Disease which occurs suddenly. It is found in abnormalities in electrocardiogram readings where the ST segment continually moves up at least 2

leads or LBBB (Left Bundle Branch Block) happens again due to sudden blockage of the coronary artery. Acute ST elevation myocardial infarction (STEMI or Acute transmutable MI or Q-wave MI) will happen if the patient's blood vessels are not opened immediately

2. Non ST elevation acute coronary syndrome found with ST segment depression and/or T wave inversion. Patients who have these symptoms over 30 minutes could face myocardial Infarction typed non-ST elevation MI (NSTEMI or Non-Q wave MI) or if the symptoms that occur are not serious only "Unstable Angina"

Cerebrovascular disease or Stroke is a Neurological disease which is becoming a worldwide public health problem that needs to be controlled and monitored regularly to decrease death rates and suffering of disabilities from this disease. World Health Organization (WHO) gives the meaning of Cerebrovascular disease or stroke as a disturbance of brain function ability which in some part or the whole of the brain happens fast and the symptoms remain longer than 24 hours until it leads to death due to disorder of blood vessels which feed the brain [20].

Types of Cerebrovascular Diseases are classified clinically by their symptoms:

1.Transient Ischemic Attack (TIA) refers to sudden abnormalities of the nervous system due to disturbances in the blood supply to the brain that happen for a while and last 5 to 10 minutes and are back to normal within 24 hours caused by embolic moving away from the heart and blood vessels blocking the brain vessels or happen from thrombosis causing insufficient blood flow around the brain. After which there may be thrombosis in vessels in the brain reducing blood flow [21].

2. Transient ischemic attack which defected nervous system but recover to normal (RIND). The abnormality symptom of these groups will remain 24-72 hours or 1 week then back to normal. The symptom depend on pathological, the reason is not clear could cause by abnormality blood circulation system temporary that makes lack of blood in the brain tissues at the small area where it deep in the tissues area. It is a possibility chance to get brain tissue death 6 times more than normal people.

3. Complete stroke symptoms are stable they do not get worst. Stable stroke does not increase swelling around the brain. Mostly this period of time found on the stroke patients.

4. Stroke with progressing or changing symptoms (Stroke in evolution, progressive stroke) means abnormality nervous system continue progress the symptom after observation for some time. Most of the reasons come from infraction mechanism that high possibility is the blockage in vessels increasing, in case of broken blood vessels, maybe repeated [22].

2.1.1 Risk Factors of Cardiovascular disease

Many studies of risk factors of cardiovascular disease found that there are many important risk factors. In Thailand there are risk factor studies which show that the most important risk factors for cardiovascular disease are high blood pressure and diabetes [23-24]. Risk factors of Cardiovascular disease divide in to 2 groups are “Non modifiable risk factors” and “modifiable risk factors as a table 2.1:-

Table 2.1 Risk factors of cardiovascular disease

Non modifiable risk factors	Modifiable risk factors
Aging	Smoking
Gender	Alcoholic drink
Nationality	Eating Behaviors
Genetic	Physical activity
	Stress
	Overweight/Obesity
	Hyperlipidemia
	Diabetes mellitus
	Hypertension

This important research study of the risk factors of cardiovascular diseases relates to the life style of the Yala people who are Islamic and non-Islamic. The risk factors of cardiovascular are variable as follows:-

(1) Diabetes mellitus

Diabetes is a chronic disease that is frequently found in 4-6% of Thai population [25]. Diabetes is one of the important risk factors of stroke especially this risk will be increased when associated with other risk factors such as, ageing, high blood pressure, including other blood vessel diseases such as coronary heart disease or peripheral vascular disease [26].

There are 4 types of diabetes:

1. Type 1 diabetes mellitus T1DM
2. Type 1 diabetes mellitus T2DM
3. Other specific types
4. Gestational diabetes mellitus, GDM

If the type of diabetes cannot be identified clearly in the beginning using clinical characteristics then diagnosis will be provisional, to be updated later from new information. In the case of necessity and as far as possible the type may be confirmed by laboratory examination results [27].

Diabetes Type 1 is found mostly in people fewer than 30 who are slim, urinate frequently, thirsty, tired and are losing weight. The symptoms happen fast and are medium to severe to very severe, and maybe ketones in the urine or ketoacidosis. Laboratory examination may show a low level of C-peptide in the blood and/or detectable immune reaction in islet cell such as Anti-GaD, ICA, IA-2.

Diabetes Type 2 This is the most common type being 95% of all diabetes normally found in people who are over 30 years, plump or overweight but may have no symptoms or have symptom such as frequent urination, thirsty, tired, loss of weight. Symptoms are not acute but maybe progressive. Type 2 Diabetes is not found in family members but other forms of Insulin Resistance might be found such as acanthuses nigricans, polycystic ovarian syndrome.

Other specific types having precise causes such as diabetes which happens from abnormality of single genetic defects, diabetes caused from pancreas, endocrine disorders, drugs, infection, immune reaction or diabetes which collaborate with other symptom. Patients have specifically characteristic or show the symptoms of the cause of diabetes.

Gestational Diabetes Mellitus (GDM) first detected in pregnant women.

Diagnosis diabetes [28, 29]

1. Patients have clear symptoms of diabetes such as thirsty, frequent and ample urination loss of weight without cause and check level of plasma glucose at any time without fasting. If the result is greater than 200 mg/dl diagnosis is Diabetic.

2. Check level of plasma glucose level in the morning after fasting more than 8 hours. (FPG) found ≥126mg/dl check again next day.

3. 75g Oral Glucose Tolerance Teat, OGTT use for patients who have high risk but found FPG less than 126 mg/dl if the level of plasma glucose 2 hours after drink≥200mg/dl diagnosis is diabetic.

In Thailand it is not recommended to use the test HbA_{1c} for diagnosing diabetes because Thailand does not have Standardization and quality control for the test HbA_{1c} this and the high cost does not make it an appropriate test for Thailand see table 2.2.

Table 2.2 Interpretation of blood sugar levels

Interpretation of the fasting plasma glucose		**Interpretation of the plasma glucose 2 hours after a 75-g glucose drink OGTT**	
Plasma levels	**Interpretation**	**Plasma levels**	**Interpretation**
FPG<100ml/dl	Normal	2 h-PG<140 ml/dl	Normal
FPG100-125mg/dl	Impaired fasting glucose (IFG)	2 h-PG 140-199mg/dl	Impaired glucose tolerance (IGT)
FPG≥126mg/dl	Diabetes	2 h-PG≥200mg/dl	Diabetes

Source: Bureau of Policy and Strategy. Prevention and Control of diabetes and high blood pressure.

Clinical assessment when diabetes is first diagnosed

When first diagnosed as having diabetes the patients history and physical examination together with laboratory tests should be reported as follows:-

History include age, symptoms, duration of diabetes symptoms and symptoms related to complications of diabetes, drug side effects which may result high blood sugar levels Glucocorticoid. Other disease relate with diabetes such as high blood pressure, abnormal cholesterol, disease of heart and brain, gout, eyes and kidney disease[because these patients have associated symptoms with diabetes], occupation, lifestyle, exercise, smoking, eating behavior, quintile, family's history of diabetes, high blood pressure, heart and brain disease.

Physical examination weight, height measurement**.** waistline, blood pressure, distal pulse, and carotid bruit, skin, feet, teeth, gum, detection of chronic disease may occur diabetic retinopathy, diabetic nephropathy, diabetic neuropathy and cardiovascular system.

The laboratory examine take blood from vein for FPG, HbA_{1c} , total cholesterol, triglyceride, HDL-cholesterol,(calculate for LDL-cholesterol or levels of LDL-cholesterol), urinalysis, check for microallbuminuria in case of symptoms of coronary artery disease or elderly should take electrocardiogram (ECG) [30,31].

Diabetes Prevention

Appropriate nutraceuticals, exercise and loss weight of 5-10% of obese people can decrease diabetes

Diabetes Treatment

Diabetes is a chronic disease need to be controlled over life with the cooperation of the patient and family to take care by instructions regularly. The treatments are:-

- Diet
- Exercise
- Take tablet to reduce sugar levels or take insulin
- Give self

- care education for patient to improve the knowledge and be able to control the diabetes correctly [32].

Prevention and treatment of complications of coronary heart disease and stroke

Patients with diabetes have higher risk of coronary artery disease than normal people which cause coronary artery disease and stroke. There is prognosis that when patients with diabetes have myocardial infarction the symptoms will be worse than patients without diabetes. There are many factors that cause atherosclerosis. Caring for patients with diabetes to prevent complication from atherosclerosis need to be united factors or holistic intensively will be able to reduce symptoms obviously and well worth [33, 34].

Detection of complications of coronary artery disease and stroke

Complications of screening for coronary artery disease in diabetes patients without symptom but there are at least 2 risks but this is not considered useful [35].

All diabetics should be screened for risk factors of coronary artery disease and stroke [36] such as:-

- Smoking
- History of coronary heart disease in the family
- High blood pressure
- Hyperlipidemia
- Peripheral arterial disease
- Detection albuminuria, with microalbuminuria and macroalbuminuria

Diabetes and Cardiovascular disease

One of the most important risk factors of Stroke especially cerebral ischemia is diabetes. The risk of stroke increase when associated with other

risk factors such as aging, high blood pressure including other vascular diseases such as Coronary Artery disease or Ischemic limbs.

Prospective epidemiology studies found the incidence of ischemic stroke in diabetes are higher than normal people. The study showed that diabetes was risk factors for Ischemic Stroke. Framingham which studied a population of 5,209 and followed them for 20 years found that diabetics have risk of stroke 2.2 times greater than people who are not diabetic[37] The Honolulu Heart Study who have been following 7,000 patient found the relative risk of Ischemic Stroke of diabetics have risk 2.0 [38]. In addition there is evidence to show that non diabetics who have Impaired glucose tolerance have higher risk of stroke than normal the relative risk is 1.4[39] while diabetics patients often die of complications heart disease and stroke. It was found that stroke cause diabetic death 12%-17%. In additional, high or low blood sugar levels in diabetic patients who have sudden ischemic stroke effects ischemic brain area. It was found that high blood sugar levels in diabetics cause worse symptom and higher death rate than people who have normal blood sugar level.

Diabetics with Stroke [40]

The study of Cerebrovascular disease or stroke found it associated with diabetic 11%-44%. The report found that mostly of 8% of patients with a history of diabetes, another 6%-42% who never knew they were diabetic before but it was detected while having treatment of cerebrovascular disease.

However patients with acute ischemic stroke will have higher blood sugar levels than normal people. (Stress hyperglycemia) This condition is found in 10% of patients and found more in patients with ischemic stroke in brainstem.

It was also found that patients with stroke associated with diabetes either known or not known that before that they had diabetes will have rate of disability and death rate higher than patients without diabetes. From the study of 53 patients with stroke who became diabetic later compared to a patients with no diabetes found that the sudden death rate of diabetics when followed up patients for 5 years is higher than patients without diabetics 2 times as high and it also found only 20% of diabetics survived after 5 years of cerebrovascular disease.

4th Health Survey result of Thai population diabetes [41]

It found the prevalence of Thai people with diabetes who over 15 years are 6.9%. Women have higher prevalence than men 7.7% and 6% respectively and prevalence increases by age from 0.6% in group age 15-29 years. The highest prevalence at group age 70-79 years in men 19.2% and 60-69 years in women 16.7%

(2) Hypertension

Hypertension is an important risk factor of Coronary heart disease and cerebrovascular disease. Hypertension causes myocardial enlargement and a need for more blood supply to the hear Additionally a very high blood pressure causes impacts on the artery wall that cause wound, and cholesterol fat silt on the artery wall [42].

High Blood Pressure medical research reported that consumption of more sodium salt cause high chance to get hypertension, in additional the eating salty from over demand of sodium salt is not only cause hypertension but also causes death from cardiovascular disease.

Diagnostic methods of high blood pressure with basic measure pressure of the arm by mercury sphygmomanometer in the sitting position 2-3 times interval at least 2 weeks. If the systolic reading is greater than or equal to 140 mmHg and/or diastolic greater than or equal 90 mmHg then high blood pressure is diagnosed [43].

Blood pressure means the value of the blood pressure on the artery walls. High blood pressure is the deviation of normal blood pressure levels which criteria for diagnosis of high blood pressure from the level related direct to the risk of cerebrovascular disease, can be divided in the levels of intensity as table 2.3:-

Table 2.3 The blood pressure levels in adult age over 18 years [44]

LEVELS	SYSTOLIC (mmHg)	DIASTOLIC (mmHg)
Normal	<120	<80
Pre hypertension	120-139	80-89
Stage 1 Hypertension	140-159	90-99
Stage 2 Hypertension	≥160	≥100

Source: The Seventh Report of JNC, 2003

Measurement of Blood Pressure Let the volunteer sit down and rest at least 5 minutes before using automatic blood pressure monitor. Measuring by letting the volunteer lean back against the chair feet on the floor, arm on the table level with the arm which used to measure at the same level of the heart. Measuring 3 times each time leave 1-2 minutes.

The cause of hypertension

There are 2 types of high blood pressure: -Primary or essential hypertension it is a group of high blood pressure that often found the exact cause is still unknown in 90% cases. Secondary hypertension is a group of high blood pressure that show a clear cause found in 10% [45].

Primary or essential hypertension or the group that unknown the symptom may cause by association with 2 factors are genes that affect the levels control of salt sodium in the body including environment factors such as food, behavior in lifestyle has changed. These are factors that increase chance to get high blood pressure.

Secondary hypertension this is a type of high blood pressure which known exactly cause if the symptom is known and be fixed patients could be recovered from high blood pressure. Kidney disease is a common that often found about 50% of secondary hypertension the secondly is endocrine disorder such as hyperaldosteronism, phacochromocytoma and some certain medicine such as groups of pain killer NSAIDs,Coxibs, birth control drugs and the supplement which contain ginseng. If these medicines are stopped the blood pressure could be back to normal or more easily be controlled. In addition, there is an increasing number of snoring patients mostly found in fat patients.

The treatment of hypertension

Modification of behavior is a necessary thing to do to control high blood pressure and it is important because it can reduce quantity and size of medication [46]. However the patients who have a high risk should not waste time

changing behavior before taking high blood pressure medicine but should do them both together. A part from adjusting behavior for blood pressure it also affects controlling risk factor of cardiovascular disease and other clinics [47] as following:-

- Limit eating salt to 5-6 g/day

- Limit alcohol not more than 20-30g of ethanol/day in men, and 10-20g of ethanol/day in women.

- Increasing vegetables, fruits and low fat milk.

- Lose weight by BMI<23kg. /m^2 and waist line <90cm. in men and <80cm. in Asian women.

- Exercise regularly at least 30 minutes of dynamic exercise medium size 5-7 days/week.

- All patients stop smoking and assisting them to reach their aims.

Hypertension and cardiovascular disease [48]

Having high blood pressure for long time may cause risk factors of cardiovascular disease, stroke. Blood pressure is a pressure on the heart vessel wall as it pushes blood out if the pressure too high for long time could damage the body. Each time the heart beats it causes blood pressure over the whole body.

Generally most of the people, who are beginning to have high blood pressure, will show no symptom and do not know themselves so they do not have treatment. The patients take treatment after the symptoms and complication show. The symptoms found such as headache, numb, dizzy, unusual tiredness, there may be symptom of tightness on the chest, sleeplessness. Having high blood pressure cause damage to the body as the symptoms shown below:-

- Weak heart beat and blood pressure not flow enough to the body could cause heart failure.

- Aneurysm normally appear on blood vessels which connect to the heart, blood vessels to the brain, legs, intestine, spleen etc.

- Blood vessels to the kidney narrower, cause renal failure.

- Blood vessels to the eyes are broken that cause vision disorder.

- Blood vessels to heart and brain are narrower cause cardiovascular and stroke.

4th Survey result of Thai population health, blood pressure disease [41]

The prevalence of high blood pressure on Thai population above 15 years is 21.4% of men and women where the prevalence is similar. The prevalence of disease is lowest in age range 15-29 years (4.6% in men 0.9% in women) then increasing by age and the highest in the group age over 80 years.

Systolic and diastolic average of Thai people age 15 years up is 122.0 mmHg and 75.2 mmHg respectively. Men have higher blood pressure than women (Systolic: 124 mmHg and 120 mmHg, diastolic: 76.7 mmHg and 73.8 mmHg respectively). Blood pressure level increases with age the highest level in the elderly age 80 years up. Diastolic increasing with age until up to 45-59 years after that blood pressure diastolic decreases with age.

(3) Lipid profile

Level of cholesterol is a component of the cell wall and other cells are floating in the bloodstream. It is very important for the human body, however lipids that are good and fats that are bad. Identifying cholesterol levels in the blood must identify clearly if it's a total cholesterol or LDL cholesterol or HDL cholesterol or triglycerides (TG). Hyperlipidemia is cholesterol that causes risk of coronary artery disease. Appropriate lipid without disease or cholesterol risk factors [49] are:-

- Total cholesterol (TC < 200 mg/dl)
- LDL cholesterol (LDL < 100mg/dl)
- HDL cholesterol (HDL < 40mg/dl in women and < 50mg/dl in men)
- Triglycerides (TG < 150mg/dl)

Cholesterol (TC) is a fat you get from food containing cholesterol and is only found in animals and products derived from animals such as butter, milk, yolk, animal organs because cells in animals all contain cholesterol. In additional the body can produce the cholesterol itself. There are no cholesterol in food

which comes from plants so it useful help reduce cholesterol in the body except food contain saturated fatty acids and unsaturated fatty acids trans which come from plants which stimulate the body to produce more cholesterol.

LDL cholesterol is cholesterol that is used to benefit cells or other organs when they match with free radicals (waste generated by the reaction in the body) will become LDL cholesterol which sensitive to inflammation cause the artery to narrow and make artery wall fragile. If there is too much it will cause blood remain in the bloodstream and be retained on the artery wall this result cause coronary artery and is called 'LDL'.

HDL cholesterol is a cholesterol that taken out from the cells or other organs and return to the liver for benefit using it to separate the cholesterol from the accumulated bad fat and destroy it just like removing a garbage. If it large volume they call "HDL". The way to increase the good fat is select useful food avoid fried food, Trans fatty food (fried food, bakery, margarine) exercise regularly, maintain shape, keep body weight in the standard level.

Triglyceride (TG) is the fat that after degradation remains free fatty acid which useful to muscle cells and the liver can bring free fatty acid to change to glucose to give energy or can produce new fat or keep it as accumulated fat in the fat cells for energy storage. If HDL cholesterol increased in the blood triglyceride will be decreased because triglyceride and HDL cholesterol normally work in opposite way. The way to reduce triglyceride is to exercise regularly at least in the medium level up. Balance eating by taking more vegetable and fruits choose to eat kinds of fish, seaweed and avoid fried food especially deep fried foods and reduce belly diet by keeping the body into a standard shape [50].

Blood lipid level (adult) should be in the normal level for a person who has no disease and this normal level should use to control and prevent cardiovascular disease. Improve yourself by having a right health behavior regularly and permanent by select choices of food, exercise, reduce belly, reduce weight also

keep body into a standard shape and keep level of cholesterol in blood in normal level, as table 2.4 [51] as follows:-

Table 2.4 The levels of cholesterol

Type of cholesterol	Cholesterol Levels [mg/dl]	Note
LDL		
Normal level	Less than 100	Levels should be for diabetics and coronary heart disease
Normal level attunement	100-129	higher level higher risk to get cardiovascular disease
Getting high level	130-159	
High level		
Very high level	160-189	should see doctor and may have cholesterol by heredity
	More than 190	
TC		
Normal level	Less than 200	Low risk of coronary heart disease
Getting high level	200-239	Medium risk
High level		
	More than 240	High risk
TG		
Normal level	Less than 150	The more higher, more risk to get cardiovascular disease
Getting high level	150-199	
High level	200-499	
Very high level	More than 500	
HDL		
Low level	Less than 40	Low risk of coronary heart
Medium level	40-59	Disease Medium risk
High level	More than 60	Low risk (higher level less risk)

Sauce: Somkiat Sangwattanaroj:-Faculty of Madicine Chulalongkorn University, 1990

High cholesterol and cardiovascular disease [48]

- The epidemiological study confirms that the consumption of saturated fat, high cholesterol food causes increased cholesterol in blood.

- The research confirms that the relationship between saturated fat, high cholesterol food and cholesterol in blood levels are associated with the death rate of cardiovascular disease.

- The study confirms that the relationship between carbohydrate consumption such as flour or rice leading attrition to remove fiber having more risk to get cardiovascular disease when compare to consuming coarse rice.

- Dietary high fiber and fruits regularly help to reduce and protect cardiovascular disease.

- Changing behavior and habit of having risk factors of chronic communicable diseases such as dietary habits and exercise can reduce HDL cholesterol effectively.

4th Health Survey result of Thai population, Hyperlipidemia [41]

The cholesterol of Thai population age 15 years up by group of volunteers fasting before has blood test 12 hours. The types of cholesterol tested are total cholesterol (TC), High Density lipoprotein Cholesterol (HDL-C), and Triglyceride (TG).

The average TC level of Thai population age over 15 years equal to 204 mg/dl. The average levels of women are higher than men (208.6 mg/dl and 199.2mg/dl.) the average cholesterol levels increase by age and the highest levels is group of men age 45-59 years, and group of women age 60-69 years then the cholesterol levels decreases with aging

(4) Body Mass Index [BMI]

Measurements of body fat is required to use measurement tools so BMI can be used precisely and related to the level of the body fat [52].

Body Mass Index calculation

$$\text{BMI} = \frac{\text{weight (km)}}{\text{height } (m)^2}$$

BMI can be measure easily by measure height and weight the result will be related to the level of body fat or from calculation. Caution of BMI value is it cannot estimate neither some people who has more muscle nor elderly who has muscle atrophy. BMI can be estimated for intensity level of obesity level. In Asians there is a different cut-off point when associated with international levels. The standard of BMI cut-off point for Asians is 23kg/m^2 and International level is 25kg/m^2. Because of characteristic shape and stature is deferent shown on table 2.5

Generally assessment of obesity use the index of body density which equal or more than 30 as criteria. Considered obese when BMI exceeds or equal 30 in Asian especially Japanese only 3%. Research study of Asian obese are only a few not enough to study associated with common disease in overweight people therefore, the research study considered new criteria for Asians, most of the information used come Japan and China. [53, 54, 55]

Table 2.5 The relationship of weight and shape in the benchmark by calculating BMI

BMI		
Groups	**WHO 1998**	**Asia-Pacific perspective**
Underweight	< 18.5	<18.5
Normal weight	18.5-24.99	18.5-22.99
Over weight	≥ 25	≥ 23
Pre-obese	25-29.99	23-24.99
Obese level 1	30-<34.99	25-29.99
Obese level 2	35-<39.99	≥30
Obese level 3	≥ 40	

Sauce: 4th Health Survey Report of Thai population by Physical Examination, 2008-2009

The risk of disease for people who overweight or fat means risk of type 2 diabetes , high blood pressure, cardiovascular disease, high cholesterol, waist circumference, even normal BMI it can be vulnerable to the disease as well. According to a person who has BMI higher than 23kg/m^2 (for Asians) neither men nor

women could risk of diabetes, hypertension, so BMI over 23 considered that obese. The research has shown that appropriated waist circumference for Asians is 90 cm. for men and 80 cm. for women [52].

Index of body density is not dependent on age and sex, however it may depend on the differences of ethnic or other environmental factors such as food, origin, so some cases may need to consider by using other index to help for decisions for example, use waist circumference and waist-hip ratio Accordingly to accept that the prevalence of overweight and obesity in each country in the world are difference. Using the same standard to the density of the population around the world needs caution[56] and must be studied about relationship between BMI which used as criteria of death rate [changed with age] and other factors such as diabetes, hypertension, gallstone and heart disease.

Over Body Mass Index than normal with cardiovascular disease

BMI more or equal to 23kg/m^2 is major risk factors for chronic disease especially type 2 diabetes and cardiovascular disease [57]. The study of appropriated BMI for Thai population [58] found level of BMI more or equal to 23 kg/m^2 is related to risk factors of cardiovascular disease. The study of cut-off point BMI which reflect to risk factors of cardiovascular disease in the group of Thai men who live in city [58] The study result found that BMI more or equal 23 kg/m^2 is indicated the condition of overweight may cause a high risk of cardiovascular disease for The men population also hypertension and hyperlipidaemia

4th Health Survey of Thai population Body mass index [41]

Average BMI of Thai population men and women above 15 years equal 23.1 kg/$m^2$and 24.4 kg/m^2 respectively.

(5) Waist circumference

When people get more energy than the body needed and relate their lifestyle by keep still without out using energy that make fat accumulated in the body cause overweight. Risk factors of other disease also depend on where is the fat

accumulated such as Android obesity have higher risk factors of hypertension, diabetes and heart disease than people who has fat around hip so waist circumference is a proper way to evaluate[60] as table 2.6.

Table 2.6 Calculating waist circumference which risk of disease of Asians [52]

Waist Circumference risk to disease	For Asians
Men > 40 inches or 102 cm	Men > 90 cm.
Women < 35 inches or 88 cm.	Women > 80 cm.

Source: Rangsan Tangtrongjitr (Editor) Obesity, Changes in nutrition and biochemistry
In: Rangsan Tangtrongjitr and Benjaluk Pholrat. Obesity and Epidemiology 2007, page 3 (Adapted from WHO, 2000)

How to measure waist circumference [61] **as following:-**

1. Stand up position both feet away from each other 10 cm.

2 Use measurement tape measure around waist at the midpoint between pelvis and the end of rib, go along pass navel.

3. Measure during exhalation makes sure that the measure tape is attached to the body and not too tight.

4. The measuring tape should be parallel on the floor.

4th Thai population health survey waist circumference [41]

Average waist circumference of Thai men and women age 15 years up equal 79.9 cm. and 79.1 cm. respectively.

(6) Metabolic Syndrome

Metabolic syndrome or abdominal obesity or central are abnormal symptom of metabolic, it is a risk factors of various disease including abdominal obesity or central, high blood sugar level, high blood pressure, cholesterol. Metabolic syndrome also call in other name such as Syndrome X or Insulin resistance syndrome. To be the same standards WHO assign to the name of Metabolic Syndrome it

increased risk to diabetes and cardiovascular disease [62] also tend to loss the life premature and disability. This is a major public health problem of many countries in the world including developed countries as America, Australia also countries in south East Asia like China, Singapore and Thailand.

Causes and risk factors

There are 2 major causes of metabolic syndrome

- Obesity

- Insulin resistance also other factors such as heredity, age, and hormone changed [63], smoking as following:-

Obesity

Obesity means excess body fat has accumulated under skin more than normal at 25-30% of body weight [64] can be divided as:-

Obesity classified by difference in the position where fat has accumulated and we can divide obesity in to 2 types:- [65]

1. Abdominal fat distribution or Android obesity is obesity where fat accumulated on the waist, body and abdomen more than upper arms and hip looks like an apple found more in men. When it is related to Insulin resistance there is increased chance to get cardiovascular disease and diabetes [66].

2. Gynoid obesity is a fat accumulated on upper arms and hip making the body look like pear shaped, found more in women [67].

Insulin resistance

It is a feature of the insulin effect on other parts of body such as liver, muscle and adipose tissue that causes congestion of sugar in blood but there are many factors involved such as genetic disorders, obesity, lack of exercise, glucose toxicity, old age or abnormalities in any body part of metabolism glucose processes, there are 4 mechanisms below:- [68]

1. Abnormalities of the action of insulin to stimulate glucose into cells peripheral tissues.

2. Liver produces more glucose.

3. Decreased insulin secretion cause abnormality of beta cells to glucose.

4. Elimination of defection insulin.

Disadvantages of insulin resistance are:- [69]

1. High sugar level in blood cause accelerates the vessels inflammation faster so it increases the chance to get cardiovascular disease by more than 2-3 times.

2. Dysfunction artery walls the vessels are less flexible causing high blood pressure, vascular inflammation and diabetes.

3. Degradation dissolves blood clots which cause coronary arteries.

4. Increase chance to get fat crystals [plaque] in blood vessels that cause risk of coronary artery disease.

5. High level insulin in blood cause high blood pressure and cholesterol, most of obese patients have high insulin in blood.

Another factor such as genetic, age, sex, hormonal changes, smoking and education [63].

1. Genetic indication of difference ethnic which component of the path physiology of metabolic syndrome found African-American have incidence of metabolic syndrome less than white people even incidence of obesity and high blood pressure higher than white people[69].

2. Age and gender, metabolism syndrome found 8 times (89% and 11%) more in elderly than early adult [70]. In elderly (80-89 years) more the adult (20-29 years) 4 times more in men (47.2% and11%) and 6 times in women (64.4% and 9.2%) [71].

3. Hormonal changes, women in early menstruation have higher risk of metabolism syndrome than the women who have regular menstruation. A study in a sample of 1,207 women found women who have first menstruation before age 12 years (25%) have more risk of metabolism syndrome compare to a group who have first menstruation when age above 14 years (22.4%) [72].

4. Smoking, cigarettes is major factor of cardiovascular diseases. The incidence study found metabolic syndrome in Japanese men who have been working in company for 7 years found that the number of smoking cigarette in each day affected the metabolic syndrome at the lowest (1%), people who smoke constantly affect metabolic syndrome at the highest 1.43%. In addition a number of cigarettes smoked per day increases the incidence of metabolic syndrome as the following order:-

- Smoking 1-20 cigarettes per day the incidence is 1.14%
- Smoking 21-30 cigarettes per day the incidence is increased 1.45%
- Smoking ≥31 cigarettes per day the incidence is 1.59% [73].

5. Education. The literature review found education is related with metabolic syndrome. People with higher education have metabolic syndrome less than people who have low education. By surveying group of 1,962 people found that a group who have level education more than 12 years cause metabolic syndrome less than a group who have education less than 5 years and 5-11 years (14.8%, 17.2%, 18.8%) [71].

Metabolic syndrome with cardiovascular disease

One of the interesting research studies and most challenge is finding information on the occurrence of cells to link between other abnormal groups, which caused metabolic syndrome, with the occurrence of path physiology symptoms which then lead to other clinical symptoms of patients. It is known that insulin resistance is basic disorders mostly found in abnormalities of metabolic syndrome thus, the cells cannot respond against the action of insulin on metabolic processes, carbohydrate, fat and protein therefore occurred various disorder such as hyper insulinemia, glucose intolerance, type 2 diabetes, hyper triglyceridemia, the concentration if high-density lipoprotein (HDL) low in blood while the concentration of low-density lipoprotein (LDL) high in blood, free fatty acid; FFA increase in blood, increased protein breakdown together with built less protein. These conditions are indicated the state of insulin resistance [74].

Obesity is often associated with other risk factors for cardiovascular disease such as high blood pressure, high cholesterol, and impaired glucose tolerance some cases found obesity is a risk factor of cardiovascular disease directly. The Framingham study found body weight is the third most important predictors of coronary heart disease in men after the age and abnormal cholesterol. There were reports that coronary heart disease in young fat people the symptoms usually occurred quite suddenly to the obese more than those who have lot of fat on the hips and thighs. The death rate of coronary heart disease in obesity may increase even though the weight is increased by only 10%. Accordingly cerebrovascular disease occurred more to the obese, so they are more than people who are not fat. Studies have found that if the pressure diastolic different 7.5 mmHg. in the range of 70-110 mmHg. Risks of cerebrovascular disease are likely to different 46% [75].

The diagnostic criteria of metabolic syndrome

In this study using criteria for Asian refers to a joint meeting between International Diabetes Federation (IDF), National Heart, Lung, and Blood Institute (NHLBI), American Heart Association (AHA) and related departments which have internationally accepted criteria. By assuming that the study participants with metabolic syndrome must have at least 3 of 5 [76] as following:-

1. Waist line from over 90 cm. in men and from over 80 cm. in women.
2. Triglyceride > 150mg/dl (1.7 mmol/L)
3. HDL-Cholesterol < 40mg/dl (1.03mmol/L) in men and < 50mg/dl (1.29mmol/L) in women.
4. Systolic blood pressure > 130mmHg or Diastolic blood pressure > 85mmHg.
5. Fasting blood pressure > 100mg/dl (5.6mmol/L)

4th Health Survey report of Thai population metabolic syndrome [41]

The prevalence of metabolic syndrome in Thai population age 15 years upwards with 21.7% prevalence in women more than men (24.5% and

18.8%) the prevalence increased with increasing age and the maximum age range at 70-79 years. Reference to meeting between International Diabetes Federation (IDF), National Heart, Lung, and Blood Institute (NHLBI), American Heart Association (AHA) [76].

(7) Lack of exercise

Lack of exercise and non-physical activity. There are many studies show evidence that having enough physical activity regularly, affect health and can reduce incidence of chronic disease such as cardiovascular disease, diabetes, obesity, and cancer. According to the World Health Organization estimate as a warning sign that without physical activity is caused cardiovascular disease by 22-23%, colorectal cancer 16-17%, diabetes 15%, stroke 12-13%. In Thailand it was found that the lack of exercise was the 9th cause of disease cause losing 1.3% of DALY.

Lack of physical activity, lack of exercise can increase cardiovascular disease more 1.5 times because lack of exercise can lead to other risk factors that increase the risk of cardiovascular disease. Exercise is meant to include exertion, having physical activity and body movement as life style as daily routine. Present research study has found that having enough exercise is medicine [77]

The words 'physical activity' or "body movement" which should occur in daily lives at the same time exercise also implies a physical activity of life which from the study document review was found to have a meaning of physical activity and exercise in variety of ways which can be summarized as follows:- [78]

Physical activity means exercise for health according to the rules of "Canada's Physical Activity Guide" specified if it a light activity must do it continuously 60 minutes per day or moderate activity must spend time 30 minutes a day and in 1 week you must follow the activity at least 4 days [79].

Physical activity means exercise for health this requires energetic activity continually at least 20 minutes and at least 3 day a week, divided into 2 types as:- [80]

1. Aerobic exercise such as walking, jogging, cycling, swimming, and dancing.
2. Resistance exercise as weight-lifting.

Walking is a suitable physical activity for everybody not limited to gender, ethnicity or Income. Several research studies have shown that walking benefits health while bicycling is an alternative physical activity [81].

Physical activity means body movement related to skeletal muscle such as walking, climbing up the stairs, gardening, playing sports, careers that related to body movement [82].

Exercise means exercise by following plans for recreation in spare time or for perfection of body (Fitness). According to the definition of exercise it must be based on specific objects such as improving integrity body for health or social reasons[82] Exercise must be in accordance to exercise prescription or FITT rules [83] refer to 4 compositions:- Frequency, Intensity, Time, Type of exercise.

In Thailand we give a definition of movement for health in the 10 commandments of exercise, that mean must do exercise at least 3 times a week and take 15-30 minutes each time. Health Ministry Department give a definition of movement for health as physical activity with the moderate exertion at least 30 minutes every day or burn 150 calories daily such as a brisk walk, trotting, skate, swimming, cycling, dancing, cleaning house, kitchen, gardening, walk up the stairs, etc. the time spent in physical activity in each day can be accumulated [84] but if the motion of exercise with heavy load at least 20 minutes for day after day would be enough [85].

The importance of exercise [77]

1. Help improving blood circulation by increasing blood flow to other parts that help to protect against heart disease, low blood pressure, improve immune system and prevent other disease such as diabetes, obesity, osteoarthritis.

2. Helping weight control give body well balance and movement more fluent.

3. Help to improve the digestive system.

4. Reduce stress and improve sleep.

Exercise divided into 2 types [49] such as

1. Aerobic or isotonic exercise is an exercise where the body is always in movement and is using oxygen all the time during this type of exercise.

The effects of exercise will result to the cardiovascular disease system. The body reacts to the heart beat faster, blood pressure slightly changed. This type of exercise is very useful to make body stronger and effective. These type of exercise are:- trotting, cycling, jump rope and aerobic dance.

2. Anaerobic or Isotonic exercise are exercises which have less movement but are high in energy. These exercises will have the effect to the body of making blood pressure higher but not increasing the pulse These exercise do not benefit to enhance the body but only benefit strength and increase muscles size. These kinds of exercise are weight-lifting, tennis.

The benefit of exercise [77]

The present medical studies are have progressed and can prevent and treat many diseases so most causes of death come from non-infectious disease and human behavior such as smoking, alcohol, drug, etc. These can be prevented or mitigated by exercise, diet, and appropriated life behavior. Prevention and improving health are most effective method and most economical for good health, therefore the benefits of exercise for health are:-

1. Prevention of heart disease, help the ability of heart to function better by doing exercises correctly and regularly for 3 months will slow down pulse and heart beat that saves energy of heart working.

2. Reduce blood cholesterol because of high blood cholesterol is one of the risk factors of coronary artery disease.

3. Increase High Density Lipoprotein Cholesterol (HDL-C) in blood the higher the more it will help prevents coronary artery disease.

4. Diet, increasing muscle (weight may not be reduced).

5. Prevent and treat diabetes.

6. Reduce blood pressure (for people who has Hypertension) can be reduced to10-15 mmHg

7. Helping improve heart, lung, blood circulation system, muscle, ligament, joints, bone and skin, reduce stress, sleeping well, good memory, sexual enhancement, slowing age, prevent back pain because muscle on the back get stronger.

8. Prevent osteoporosis especially menopausal women

9. Helping body change fat in to energy which saves using glycogen which has less and prevents heart disease.

10. Prevent some certain cancer such as colon cancer, breast cancer, prostate cancer.

11. Improve heath saving cost of treatment.

Exercise with cardiovascular disease [48]

- Body movement and exercise are effected to decrease the level of LDL cholesterol 22%, decrease level of Triglyceride 20%, reduce weight 4% and increase HDL 12% by overall effect rate of thrombosis cause by cholesterol.

- In an effort to control level of cholesterol including weight reduction, most of the studies have found that exercising regularly together with food control will give the highest performance and the lowest budget compared to taking fat reducing medicines.

- In exercise programs 30 minutes per day together with food controlling by selected food with fiber, low fat, reduce sugar and salt in 4 weeks found weight, BMI, blood pressure decreased significantly statistically

- The study has found people who has less movement activity will has risk of cardiovascular disease 2 times more those who have body movement regularly.

- Exercise myocardial efficiency is walking on the conveyor belt at speed which level of heart beat at 70-85% of maximum heart beat rate is 40-60 minutes.

International Physical Activity Questioner (IPAQ)

Assessment body movements can be used to test for children and adult in age range 15-69 years. The improvement of physical activity assessment started in Geneva year 1998 and has been widely reliable in 12 countries; it was published in several languages and it suitable for assessment, taking part in physical activity. Assessment of physical activity that is used as a short form in Thai version.

There are 7 items (IPAQ) to determine the rate of metabolism the number of minutes per week metabolic equivalent of task in minutes/week, METs [86-87]

The survey result of the 4th Thai nationality health exercise or physical activity [41]

The prevalence of physical activity is not enough, in only 18.5% (men 16.8% and women20.2%) slightly lower than the survey result of the 3rd Thai nationality health in years 2003-2004 (men 20.7% and women 24.2%) Although using the same standard survey questionnaire as World Health Organization there are observations that the information of physical activity respondents may assess themselves higher than reality, this may cause the ratio of those who have enough physical activity are slightly higher. However the 3rd and the 4th health survey of Thai population are using the same questionnaire so it should be comparable.

(8) Smoking

The situation of worldwide smoking

According to the report of World Health Organization inform that currently there are 1,300 million of smokers around the world. The number of the cigarettes smoked per day more than 15,000 million by more than half or 54.5% of all smokers in Asian followed by Africa and Middle East 11.8% Central Europe and East Europe 10.8%, West Europe 9.3%, Latin American and Caribbean Islands 8.9% and North American 4.6%. There are death tolls from smoking in a year around 5 million people about half of these are in the developing countries and it is expected that in next 25 years a number of death toll from smoking will be increased 10 million people a year most of them are of working age causing premature death 20-25 years [88]

Smoking is an important risk factor of cardiovascular disease, in this case it is including regular smokers and those who are not smokers but get cigarette smoke from others it is called secondhand smoke. Consumers who take smokeless tobacco such as tobacco [49] including those who stopped smoking for 5 years will have a chance to get cardiovascular disease equally as those people who do not smoke, according to a Framingham study of a group 177,999 nurses. [89]

Cigarettes with Cardiovascular disease

Cardiovascular Disease smoking is as an important risk factor similar to atherosclerosis coronary artery spasm and cardiac arrhythmias as well as the ability to transfer oxygen. Past studies showed smoking as a cause of cardiovascular disease It is estimated that smoking is the cause of death by cardiovascular disease of 17- 30% the potential of cardiovascular disease in smokers depends upon the amount of smoking. Smoking only 1-4 cigarettes a day causes a risk of cardiovascular disease. The risk for women is the same as men but if they are on a birth control pill their risk is increased 10 times. For smokers who have other risk factors like hypertension or high Cholesterol will have more chance of getting the disease. In addition smoking decreases the effectiveness of drugs [by reducing the level of drug in the blood stream] used to treat heart disease such as Propranolol [90].

According to relationships study of smoking with heart disease and other blood vessels found relative risk of cardiovascular disease in smokers equal 1.5 times and heavy smokers more than 40 cigarettes a day have high risk of heart disease and blood vessels 2 times more than those who smoke less than 10 cigarettes a day [91].

4th Health survey result of Thai population smoking [41]

The prevalence of smoking in Thai population age over 15 years, Health survey 4th Thai population in year 2009 is reduced from the 3rd survey. Men smokers regularly decrease from 45.9% to 38.7%, women smokers regularly decrease from 2.3% to 2.1%. The number of cigarette which smoked by men daily average decrease from 12 cigarettes a day to 10.6 cigarettes a day but in women average per day increase from 8 cigarettes to 9 cigarettes.

2.2 Society, Culture and Health Behavior that risk of cardiovascular disease in Islamic and non-Islamic Thai people in Yala province

2.2.1 Society and culture of Yala province

Culture and lifestyle of Muslim in Thailand are mainly society in the 3 southern provinces. Recently there are aspects of integration which depend on 1] Act of worship 2] Tradition 3] Regulations of the country 4] Universality. These are reasons why Muslim societies in everywhere intend to maintain their identity in being the best Muslim. They are worried and suspicious that they might lose their identity so they need religious intellectuals to provide education and training to guide them how to practice from birth until death at every steps. This is because of religion and cultures in the meaning of Muslim lifestyle are not to be separated [92].

Professor Pravas Vasee gave the meaning of culture is sharing lifestyle of the group of people with the one environment compliance surrounding with variety of environment therefore, cultural diversity, culture which means wide and deep including sharing their believe, sharing common value. Religion is a common of any nations so religion also is a culture [93].

In Yala province there are Islamic Thais and non-Islamic Thais with other religions have been together for long time some area around 100 years and keep their relationship as relatives [94].

(1) State of Society

Population of Yala most of them are Thai Muslim with routine communication by using Malaya local language and adherence of the doctrine strictly and learning and inherit culture and traditional to other or the next generation.

(2) Education

In Yala province there are education from kindergarten, primary schools, secondary schools, high schools, general education, vocational education to bachelor degree including the institution that only teach religious and private schools teaching Islamic together with general and religious instruction. Most

of Islam Thai people send their children to these schools because education in religious subjects is importance for being a good Muslim.

(3) Culture and Traditions

Culture and Traditions of Yala people are similar and not different to the other provinces but Yala has variety of cultures because there are groups of people in many languages, nation and religious whether they are Thai-Chinese and Thai-Buddhism which each group have their own culture but the difference do not cause any problem also their combination of cultures and lifestyle until they can live together.

2.2.2 Health behavior risk of cardiovascular disease of Islam and non-Islam Thai people in Yala province.

(1) Dietary behavior

According to the research culture integration of Thai-Buddhism, Thai-Chinese, Thai-Muslim in Muang district, Pattani province has found that food consumption culture of Pattani people who are different in nation, religious as the validity of food raw material cause all Thai-Buddhism, Thai-Chinese and Thai Muslim have similar food consumption characteristics but there is some difference in prohibition of religious as Thai Muslim do not eat pork this is based on religious doctrine [95]. The type of food which Thai Buddhism in southern have a spicy flavor such as sour curry, fish curry southern style etc. Thai Chinese eat sort of boil food, fried food, steam food such as fried morning glory vegetable, noodles, pork Chinese stew etc. Thai Muslim take food like coconut curry and flour such as massaman curry, roti, yellow curry etc [95]. According to research, the health behavior of Thai Muslims which causes risk of cardiovascular disease, found that the dietary behavior of Thai Muslim have more risk than Thai non Muslim because of their food which is high in fat and calories [96]. Health care behavior which is associated with chronic non-communicable diseases found in Thai Muslim mostly is diabetes, high blood pressure, often found in elderly probably due to the way of eating incorrectly by and lack of exercise [97].

(2) Smoking behavior

Research into the life style of Thai Muslims to enhance health has studied the Muslim Community in central, north, upper south, and lower south and found that the smoking behavior of a group of Muslims in the south is higher than other sectors such as upper south and lower south 60.62% and 60.33% respectively [97]. The report of the smoking behavior and the risk behavior survey of non-communicable diseases is a report on a survey of Thai population age15-74 years about determining the risk behavior for non-communicable diseases. Comparison between Thai Muslim and Thai in the whole country 4 surveys (2004, 2005, 2007 and 2012) has found recently that the prevalence of smoking in a group of Muslims increased significantly when compared to the people in the whole country. Recently the smoking prevalence of Muslim men is significantly higher than other men in the country in statistical terms but the recent smoking prevalence of Muslim women is not different from other women in the country considering that difference of smoking in of men is significantly higher than women statistically [98]**.**

As the health report survey of Thai population in the 4th physical check up has found men in the south have the highest prevalence of smoking, second are north east, central, north and Bangkok. [40] According to research and knowledge management for tobacco control in year 2012 found in the south still have the highest rate of smoking at 25.6%, secondary is North East 23.5%, North 20.5%, Central 19.2% and Bangkok 15.4% [99].

(3) Behavior of exercise

Qualitative research aimed to explain the principles of exercise, by lifestyle, to Muslim housewives and the promotion of physical movement which accords to their religious principles shows that most religious leaders confirm that it must not be against Islamic doctrine but must at a place and dress appropriate to Muslim women [100].

The research in to the relationship between beliefs with exercise behavior of Muslim teen girls at Islamic private school in the South found a perception of risk of disease from lack of exercise and also perceived the barrier to

exercise in the Islamic doctrine which related in the medium level of exercise behavior but realizing the risk of chronic diseases in the future from lack of exercise [101].

The fourth health report survey of Thai population in year 2008-2009 surveyed the physical activity of Thai population age over 15 years to cover enough activity recommended that means having physical activity over a medium level as 30 minutes a day at least 5 days a week. The proportion of time spent in physical activity from work, walking, cycling and physical activity in free time not enough it only 18.5% (men 16.8% and women 20.2%) which lower the health survey the 3rd in year 2003-2004 [41].

This research is the study a comparative study of risk factors for cardiovascular disease among Islam and non-Islam. The variables studied in this research study factors consistent with the context of the people in the area and are major risk factors of cardiovascular disease including hypertension, diabetes mellitus, metabolic syndrome, body mass index (BMI), waist circumference lipid profile, lack of exercise and smoking.

2.3 Related literature

Risk factors for cardiovascular disease, there are many factors. In this study the study of documents and research review it was found that cardiovascular disease risk factors are as follows.

2.3.1 Population characteristics

1) Age

Panapat Tocharoenvanich et al [102] studied the risk factors for A Five-year Death in The InterASIA-South Cohort. To determine the mortality rate and risk factors for death in a selected population in Songkhla province in southern Thailand. Collected variables were the conventional ones and included the 2 ethnic groups which are specific for southern Thailand, i.e. Malay Muslims and Thai-Chinese Buddhists. Causes of death were determined by reviewing hospital records. The follow-up was 5 years. The results death for stroke coronary heart disease and

cancer half of the deaths occurred in subjects older than 70 years. There was statistically significant risk factor for cardiovascular disease

Chongsuvivatwong V et al [13] studied the gender and ethic differences in cardiovascular risks in Songkhla province Thailand the inter Asia-south. The subset of data on southern Thai Inter Asia study conducted in 2000 was revisited in order to document gender and ethnic breakdown of prevalence of risk factors for cardiovascular disease. The results age older statistically significant risk factors for cardiovascular disease.

Piyamitr sritara [103] Twelve-year changes in vascular risk factors their associations with mortality in a cohort of 3499 Thais: Electricity generating authority of Thailand study. The results age older statistically significant risk factors for cardiovascular disease, according to the study Kanya photipi [104], Sonia S Anand et al [105], Danial P Capingana et al [106], Edgar Brice Ngoungou et al [107] found that the age more associated with risk factors of cardiovascular disease.

2) Gender

Panapat Tocharoenvanich et al [102] studied the risk factors for a five-year death in the inter Asia-south cohort. To determine the mortality rate factors for death in a selected population in Songkla province in south Thailand. Collected variables were the conventional ones and included the 2 ethnic groups which are specific for southern Thailand, i.e. Malay Muslims and Thai-Chinese Buddhists. Causes of death were determined by reviewing hospital records. The follow-up was 5 years. The results a man associated for risk factors cardiovascular disease cancer and man death more women statistically significant.

Chongsuvivatwong V et al [13] studied gender and ethic differences in cardiovascular risks in Songkhla province Thailand the inter Asia-south. The result risk factors for cardiovascular disease among Thai Buddhist and Thai Muslim, found a man associated for cardiovascular disease statistically significant.

Kanya photipiti [104] studied the behavior and risk factors for cardiovascular disease of pre elderly. Includes suggestions for consideration of health promotion and prevent the risk of cardiovascular disease using the data of

Kanchanaburi project year 2004 found age before the elderly males have higher risk behaviors of female significantly.

3) Religion

Chongsuvivatwong V et al [13] studied gender and ethic differences in cardiovascular risks in Songkhla province Thailand the inter Asia-south. The results risk factors for cardiovascular disease among Thai Buddhist and Thai Muslim, found difference statistically significant.

4) Marriage status

Chanjira songtek [108] studied the behavior risk factors for cardiovascular disease of Thai Muslim in meesuwan 3 community Bangkok. Found marriage status no associated with risk factor for cardiovascular disease statistically significant.

5) Education

Piyamitr sritara [103] Twelve-year changes in vascular risk factors their associations with mortality in a cohort of 3499 Thais: Electricity generating authority of Thailand study. The results risk factors for cardiovascular disease in the electricity generating authoricity of Thailand, found level of education associated with risk factors for cardiovascular disease, according to the study Kanya photipiti [104] and Chanjira songtek [108] the results level education associated with risk factors for cardiovascular disease significant.

6) The occupation

Kanya photipiti [104] studied the behavior and risk factors for cardiovascular disease of pre elderly. Includes suggestions for consideration of health promotion and prevent the risk of cardiovascular disease using the data of Kanchanaburi project year 2004. Found that the farmers associated with risk factors of cardiovascular disease according to the study. Olarinde J Ogunmola et al. [109] the results that the farmers associated with risk factors for cardiovascular disease statistically significant.

7) The past illness of family non-communicable disease

Sonia S Anand et al [105] studied Differences in risk factor atherosclerosis, and cardiovascular disease between ethnic groups in Canada: the study of health assessment and risk in Ethnic groups (SHARE). Cardiovascular disease rates vary greatly between ethnic groups in Canada. To establish whether this variation can be explained by differences in disease risk factors and subclinical atherosclerosis, we undertook a population-based study of three ethnic groups in Canada: South Asians, Chinese, and Europeans. The results the history of illness, family non-communicable diseases associated with risk factor of cardiovascular disease, as the illness of a family that diabetes with hypertension.

2.3.2 Risk factor for cardiovascular disease

1) Hypertension

Panapat Tocharoenvanich et al [102] studied the risk factors for a five-year death in the inter Asia-south cohort. To determine the mortality rate factors for death in a selected population in Songkla province in south Thailand. Collected variables were the conventional ones and included the 2 ethnic groups which are specific for southern Thailand, i.e. Malay Muslims and Thai-Chinese Buddhists. Found that patients with hypertension associated with risk factors of cardiovascular disease, which is consistent with the study Yipitsoi T et al [12] studied prevalence of cardiovascular risk factors in rural area in southern Thailand potential ethnic differences. Study of risk factors of cardiovascular disease among Thai Buddhists and Muslims found that hypertension resulting in male and 2 groups related to risk factors for heart disease and atherosclerosis. For piyamitr sritara [103], Sonia S Anand et al [105], Edgar Brice Ngoungou et al [107] Akplakorn W et al [110] found that patients with hypertension associated with risk factors of cardiovascular disease, is statistically significant.

2) Diabetes mellitus

Panapat Tocharoenvanich et al [102] studied the risk factors for a five-year death in the inter Asia-south cohort. To determine the mortality rate

factors for death in a selected population in Songkla province in south Thailand. Collected variables were the conventional ones and included the 2 ethnic groups which are specific for southern Thailand, i.e. Malay Muslims and Thai-Chinese Buddhists. Found that patients with diabetes associated with risk factors of cardiovascular disease, which is consistent with the study Edgar Brice Ngoungou et al [107], Olarinde J Ogunmola et al [109] Akplakorn W et al [110] found patients with diabetes are associated with risk factors of cardiovascular disease, is statistically significant.

3) Body mass index

Kanya photipiti [104] studied the behavior and risk factors for cardiovascular disease of pre elderly. Includes suggestions for consideration of health promotion and prevent the risk of cardiovascular disease using the data of Kanchanaburi project year 2004. Found that body mass index < 25 kg/m^2 risk of cardiovascular disease than the group with a body mass index of ≥ 25 kg/m^2 which corresponds to their education, ,Pongchaiyakul C[111], Sonia S Anand et al [105], Edgar Brice Ngoungou et al [107], Danial P Capingana et al [106], Found body mass index than normally associated with risk factors of cardiovascular disease, is statistically significant.

4) Waist circumference

Panapat Tocharoenvanich et al [102] studied the risk factors for a five-year death in the inter Asia-south cohort. To determine the mortality rate factors for death in a selected population in Songkla province in south Thailand. Collected variables were the conventional ones and included the 2 ethnic groups which are specific for southern Thailand, i.e. Malay Muslims and Thai-Chinese Buddhists. Found waist circumference than the standards set for both male and female associated with risk factors of cardiovascular disease. According to the study Olarinde J Ogunmola et al [109], Danial P Capingana et al [106] found Waist circumference than the standards set for both male and female associated with risk factors of cardiovascular disease, is statistically significant.

5) Lipid profile

Sonia S Anand et al [105] studied Differences in risk factor atherosclerosis, and cardiovascular disease between ethnic groups in Canada: the study of health assessment and risk in Ethnic groups (SHARE). Cardiovascular disease rates vary greatly between ethnic groups in Canada. To establish whether this variation can be explained by differences in disease risk factors and subclinical atherosclerosis, we undertook a population-based study of three ethnic groups in Canada: South Asians, Chinese, and Europeans. Found high total cholesterol, Low HDL-cholesterol, High LDL- cholesterol, High Triglyceride associated with risk factor for cardiovascular disease and the studied Pongchaiyakul C [111], Akplakorn W et al[110] the results High total cholesterol, Low HDL-cholesterol, High LDL- cholesterol associated with risk factors for cardiovascular disease and the studied Danial P Capingana et al [106] the results Low HDL-cholesterol associated with risk factors for cardiovascular disease, is statistically significant.

6) Metabolic syndrome

Kanengnid Srisala and al [112] studied the prevalence metabolic syndrome the meaning of NCEP IDF WHO, and participants in the cardiovascular disease and the Electricity Generating Authority of Thailand. The results metabolic syndrome associated for risk factor cardiovascular disease by definition, criteria of assessment, and metabolic syndrome NCEP IDF WHO is statistically significant.

7) Lack of exercise

Kanya photipiti [104] studied the behavior and risk factors for cardiovascular disease of pre elderly. Includes suggestions for consideration of health promotion and prevent the risk of cardiovascular disease using the data of Kanchanaburi project year 2004. Found that no exercise associated with risk factors of cardiovascular disease, is statistically significant.

8) Smoking

Panapat Tocharoenvanich et al [102] studied the risk factors for a five-year death in the inter Asia-south cohort. To determine the mortality rate factors for death in a selected population in Songkla province in south Thailand. Collected variables were the conventional ones and included the 2 ethnic groups which are specific for southern Thailand, i.e. Malay Muslims and Thai-Chinese Buddhists. Found that smoking is associated with risk factors of cardiovascular disease. According to the study**,** Piyamitr sritara [103], Kanya photipiti [104]**,** Edgar Brice Ngoungou et al [107], Olarinde J Ogunmola et al [109] the results smoking associated with risk factors for cardiovascular disease, is statistically significant.

CHAPTER III
MATERIAL AND METHODS

Study Design

This study is a cross-sectional analytic study comparing each risk factor for cardiovascular disease between Islamic and non-Islamic Thai people in a province situated in lower southern part of Thailand. The study protocol was approved by Sirijaj Institutional Review Board Each participant gave a written informed consent before enrollment into the study.

Populations and Samples

Study population

The population in this study includes people living in the area of Yaha District, Yala Province.

Inclusion criteria

1) Age 35 years or older
2) Willingness to participate in the study
3) Being able to understand and communicate in Thai language well

Exclusion criteria

1) Having impaired hearing or vision
2) Being bedridden
3) Being diagnosed with ischemic or coronary heart disease, stroke, peripheral arterial disease, or heart failure
4) Having mental disability
5) Monks and novices

6) Pregnant women

Variables and Definitions

1. Age: Age is considered by the date of birth indicated in the national identification card, or by direct questioning of the participant if the national identification card was not available.

2. Religion: Direct interview of the participant's religion.

3. Marital Status: Direct interview of the participant's marital status, which was classified into the following categories:

- Single: The participant has never been married.

- Married: The participant maintains a husband-wife relationship with his/her spouse whether legally or not.

(1) Married and stay together: Spouse living in the same house.

(2) Married but do not stay together: Spouse living in different house.

- Widowed: The participant's spouse already passed away while the married status was still in effect, and the participant has not re-married.

- Divorced: The participant and his/her spouse agreed to terminate their marital relationship legally and registered their divorce with the registrar.

- Seperated: The participant and his/her spouse agreed to terminate their marital relationship but did not register their divorce legally. It also refers to those who do not have their marriage registered legally but no longer stay together as husband and wife.

4. Education: Direct interview of the participants' highest education in common education system or religious education system (in case the participant did not attend common education).

5. Occupation: Direct interview of the participant's occupation, which was defined as work or any activity that created income for one self and family. If the participant had more than one occupation, the one with the longest working hour was recorded.

6. Family history of hypertension, diabetes mellitus, or stroke: Direct interview of the presence of these conditions in the participant's first degree relatives (parents and siblings).

7. Hypertension: The status of hypertension of a participant was determined by either one of the following method: (1) direct interview of being diagnosed with hypertension by a physician or currently taking anti-hypertensive medications; (2) blood pressure measurement with the systolic blood pressure (SBP) of ≥140 mmHg or the diastolic blood pressure (DBP) of ≥90 mmHg.

8. Diabetes mellitus: The status of diabetes mellitus of a participant was determined by either one of the following method: (1) direct interview of being diagnosed with diabetes mellitus by a physician or currently taking anti-diabetic medications; (2) blood test with fasting plasma glucose (FPG) of≥126 mg/dl.

9. The metabolic syndrome: The presence of the metabolic syndrome was determined by information gathered from direct interview, physical examination and blood test. The metabolic syndrome was present if there were at least three of the following criteria [76]:

1) Waist circumference of 90 cm or higher in males and 80 cm or higher in female.

2) Triglyceride ≥150 mg/dl, or current drug treatment for high triglyceride.

3) HDL-cholesterol <40 mg/dl in male and < 50 mg/dl in female, or current drug treatment for reduced HDL-C.

4) SBP≥130 mmHg and/or DBP>85 mmHg, or current drug treatment for high blood pressure.

5) FPG≥ 100 mg/dl, or current drug treatment for elevated glucose levels.

10. Body Mass Index (BMI): The participant's BMI was calculated based on height and body weight according to the equation:

$$\text{Body Mass Index (BMI)} = \frac{\text{Weight (Kilogram)}}{\text{Hight (Meter)}^2}$$

11. Level of exercise: The participant's level of exercise was assessed using the International Physical Activity Questionnaire (IPAQ) [86-87]. The

questionnaire assesses the intensity of physical activities in metabolic equivalent unit (MET), with1 MET representing the amount of oxygen consumed by the body at resting state in one minute. METs are assigned to each activity according to its intensity as follows:

- Vigorous intensity activity = 8.0 METs
- Moderate intensity activity = 4.0 METs
- Walking = 3.3 METs

The METs of each activity is multiplied by the duration and frequency (per week) of that particular activity to obtain the score:

- Vigorous intensity activity = 8.0 × duration in minutes × number of days per week
- Moderate intensity activity = 4.0×duration in minutes × number of days per week
- Walking = 3.3 × duration in minutes × number of days per week

Total score (sum of scores) = Vigorous intensity activity +Moderate intensity activity + Walking

The total score is categorized into 3 groups as follows:

(1) Low physical activity is the score of less than 600 METs-min/week.

(2) Moderate physical activity is the score of 600– 2,999 METs-min/week.

(3) High physical activity is the score of 3,000 METs-min/week or more.

The International Physical Activity Questionnaire (IPAQ) was tested for its validity and reliability in various populations, including Thais and Malays [114, 115]. In a study among 115 hospital staff aged 20-60 years old at Phramongkutklao Hospital, Bangkok, the Thai version of short form IPAQ was found to be moderately correlated with physical activity recorded by accelerometer (Spearman's rank correlation coefficient 0.32) and acceptable test-retest reliability (intraclass correlation coefficient (ICC) 0.69, 95% confidence interval 0.55 to 0.78) [114]. In a group of 81 adults in Malaysia, the Malay version of IPAQ was significantly related with 7-day physical activity log, with a moderate-to-good test-retest reliability (ICC 0.54 – 0.92) [115]. In this study, the IPAQ was pretested in a group of 30 subjects aged 35 years or older in a predominantly Muslim population in Pattani, a province adjacent to Yala.

12. Smoking: Direct interview of participant's smoking habits and the amount of smoking.

Data Collection

The researcher organized a meeting with public health volunteers from each participating health center in order to explain the objectives and procedures of the study. Each public health volunteer then distributed invitation letters to selected participants living in his/her responsible area asking them to attend a meeting arranged to explain the details of the study and to invite for participation (see the details of the sampling process in "Statistical methods" section below).

On the appointment date, the researcher explained the objectives and the study procedures to the potential participants who attended, and answered all questions that arose until they clearly understood the study. Those who agreed to participate were asked to sign a written informed consent form.

Data were collected from each participant by means of a self-administered questionnaire, physical examination and blood tests. For subjects who could not fill in the self-administered questionnaire, the researcher conducted a face-to-face interview instead. All interviews were conducted by the same interviewer. Physical examination included the measurements of body weight, height, waist circumference and blood pressure. Waist circumference was measured in standing position while the participant breathed quietly. The measuring tape was placed horizontally at the navel level. Blood pressure measurement was performed after the participant had been rested for 10-15 minutes. The participant was in sitting or supine position. If the blood pressure was measured in sitting position, the participant placed the arm on a table. In Supine position, the participant had the arm slaid beside the body with the palm opened. The measurement was done using an automated digital blood pressure machine. Physical examination was carried out by staff at each participating health center. Blood test included fasting plasma glucose (FPG) and lipid profiles. Participants were required to fast for 10 – 12 hours during the night and had the venous blood drawn in the morning on the day of examination. For FPG, 2 ml of blood was put in a test tube containing sodium fluoride. For lipid profiles, 5 ml of blood was put in a test tube containing lithium heparin

anticoagulant. The blood specimen was delivered to the laboratory at Yaha Crown Prince Hospital within 4 hours after venipuncture.

The results of physical examination and blood tests were reported to participants individually by the responsible health centers. Participants found to have health problems were treated locally or referred to Yaha Crown Prince Hospital as appropriate.

Statistical method

Sample size estimation and sampling method

Sample size was calculated based on the approach of hypothesis testing for comparison of 2 independent proportions, allowing for unequal sample size in each group. The sample size formula by Machin and Campell was used as follows [113]:

$$n_1 = \frac{\{z_{\alpha/2}\sqrt{(k+1)\bar{\pi}(1-\bar{\pi})} + z_{\beta}\sqrt{k\pi_1(1-\pi_1)+\pi_2(1-\pi_2)}\}^2}{k(\pi_1-\pi_2)^2}$$

Where

n_1 = Sample size of Islamic Thais

n_2 = Sample size of non-Islamic Thais; $n_2 = k\ n_1$

k = Ratio of non-Islamic Thais to Islamic Thais, which was 0.5[10].

π_1 = Proportion of subjects with low HDL-C in Islamic Thai. This proportion was calculated based on π_2 and OR (see below) using the formula:

$$\pi_1 = \frac{(OR)\pi_2}{(OR)\pi_2+(1-\pi_2)}$$

π_2= Proportion of subjects with low HDL-C in non-Islamic Thais, which was 0.47 [41].

$$\bar{\pi} = \frac{(\pi_1+k\pi_2)}{1+k}$$

OR = Odds ratio of low HDL-C comparing Islamic to non-Islamic Thais, which equaled 2 [13].

$Z_{\alpha/2}$ = The value at the 100 (1-α/2)th percentile of the standard normal distribution curve, which is 1.96 when α is set at 0.05.

Z_{β} = The value at the 100 (1-β)th percentile of the standard normal distribution curve, which is 1.28 when βis set at 0.1.

Therefore $\pi_1 = \frac{(OR)\pi_2}{(OR)\pi_2+(1-\pi_2)} = \frac{2(0.47)}{2(0.47)+(1-0.47)} = 0.64$

$\overline{\pi} = \frac{(\pi_1+k\pi_2)}{1+k} = \frac{0.64+2(0.47)}{1+2} = 0.53$

$$n_1 = \frac{\{1.96\sqrt{(2+1)0.53(1-0.53)}+1.28\sqrt{2(0.64)(1-0.64)+0.47(1-0.47)}\}^2}{2(0.64-0.47)^2}$$

$n_1 = 264.7$

The sample size of Islamic Thais was 270 people.

$n_2 = kn_1 = 0.5(270) = 135$

The sample size of non-Islamic Thais was 135 people.

Therefore, the total sample size in this study was 405 people.

Sampling: This study is used stratified random sampling technique. The sampling frame was people aged 35 or older living in Yaha District, Yala.

1) Primary Sampling Selection

From the total of 7 sub-districts in Yaha District, 4 sub-districts with both Islamic and non-Islamic residents were purposively selected for sampling in this study. The numbers of residents covered by each health center in each sub district are shown in Table 3.1.

Table 3.1 Number of Islamic and non-Islamic residents under the coverage of each Health Center in each sub-district

Sub-District	Health Center	Number of people aged 35 years or older	
		Islamic	Non-Islamic
1.La-ae	La-aeSub-districtHealthPromotingHospital	676	51
	BaanKubaerayoaHealthPromotingHospital, La-aeSub-district	539	80
2.Patae	PataeSub-districtHealthPromotingHospital	1,601	282
	BaanKhoroaramaeHealthPromotingHospital, PataeSub-district	1,761	240
3.Yaha	YahaCrownPrinceHospital	1,446	235
	BaanLakorHealthPromotingHospital, YahaSub-district	1,564	82
	YahaMunicipalityHealth Center	536	328
4.Tachee	TacheeHealthPromotingHospital	83	787
	Total	8,206	2,085

The number of participants in non-Islamic group was designed to be proportionate to the number of non-Islamic residents covered by each health center. Then the number of participants in Islamic group was set at 2 times the number of non-Islamic participants in each health center in order to represent the proportion of Islamic to non-Islamic population at the provincial level. The numbers of participants recruited from each health center are shown in Table 3.2.

Table 3.2 Number of participants recruited from each Health Center.

Sub-District	Health Center	Number of non-Islamic people aged 35 years or older	Number of Study participants	
			non-Islamic	Islamic
1.La-ae	La-ae Sub-district Health Promoting Hospital	51	$\frac{51\times135}{2,085} = 4$	4×2 = 8
	Baan Kubaerayo Health Promoting Hospital	80	$\frac{80\times135}{2,085} = 5$	5×2 = 10
2.Patae	Patae Sub-district Health Promoting Hospital	282	$\frac{282\times135}{2,085} = 18$	18×2 = 36
	Baan Khoroaramae Health Promoting Hospital	240	$\frac{240\times135}{2,085} = 15$	15×2 = 30
3.Yaha	Yaha Crown Prince Hospital	235	$\frac{235\times135}{2,085} = 15$	15×2 = 30
	Baan Lakor Health Promoting Hospital	82	$\frac{82\times135}{2,085} = 6$	6×2 = 12
	Yaha Municipality Health Center	328	$\frac{328\times135}{2,085} = 21$	21×2 = 42
4. Tachee	Tachee Health Promoting Hospital	787	$\frac{787\times135}{2,085} = 51$	51×2 = 102
	Total	2,085	135	135×2 = 270

2) Secondary Sampling Selection

Random sampling technique was used for selection of participants based on the name list of residents, ordered by household number, living in the catchment area of each health center. Participants in Islamic and non-Islamic group were matched for gender and age (± 3 years).

Data analyses

Data were checked for accuracy and completeness before analyses. Data analyses were carried out according to study objectives and hypotheses. Categorical variables were summarized using frequency and proportion. Continuous variables were tested for normality using Shapiro-Wilk test if the sample size was less than50, and Kolmogorov-Smirnov test if the sample size was 50 or more. Mean and standard deviation were presented for continuous variables with normal distribution. Non-normal continuous variables were summarized using median and inter quartile range.

Chi-square test was used to compare categorical variables between groups. For continuous variables, independent t-test was used for comparison of means and Mann-Witney U-test for comparison of medians. All statistical tests were carried out at the significance level of 0.05. The magnitude of difference between Islam and non-Islam groups was represented using prevalence rate ratio (PRR), with data layout shown in Table 3.3 and the formula for calculation shown below. All analyses were performed using PASW Statistic software version 18.

Table 3.3 Data layout for the calculation of prevalence rate ratio (PRR)

Factor	**Group**	
	Islam	**Non-Islam**
Yes	a	b
No	c	d
	a+c	b+d

$$\text{PRR} = \frac{a/(a+c)}{b/(b+d)}$$

CHAPTER IV
RESULTS

This study is a comparative study of risk factors for cardiovascular disease in a population in a province situated in lower southern part of Thailand. Participants were Islamic and non-Islamic Thais aged 35 years or older living in Yala province. There were 405 individuals participating in this study, 270 Islamic Thais and 135 non-Islamic Thais. Data were collected between November 2014 to February 2015.The results are presented in this chapter in the following order:

Part 1: General demographic characteristics including gender, age, marital status, education, occupation, and family members' medical history.

Part 2: Risk factors for cardiovascular diseases including hypertension, diabetes mellitus, the metabolic syndrome, body mass index, waist circumference, and lipid profiles.

Parts 3: Health behaviors including level of exercise and smoking.

4.1 Demographic characteristics

Part 1: Demographic Characteristics (Table 10)

Gender and Age: The median ages of subjects were 52 years old. There were slightly more females than males. There was no difference in age and gender between Islamic and non-Islamic groups as these 2 factors were matched between groups.

Marital Status: About 90% of participants were married. The marital status of Islamic and non-Islamic Thais was not statistically significantly different (p=0.074).

Education: About 70% of participants had basic compulsory education, with 50% elementary education. Some 10% of the participants did not have formal education. There was no statistically significant difference in education levels between Islamic and non-Islamic Thais (p=0.940**)**.

Occupation: Farmers accounted for about two-third of study participants. The proportions of each occupation were not statistically significantly different between Islamic and non-Islamic subjects (p=0.196).

Family history of hypertension, diabetes mellitus or stroke: The proportion of subjects with a family history of at least one of these conditions in the Islamic group was slightly less than that in the non-Islamic group. However, the difference was not statistically significant (48.1% vs. 54.1%, p = 0.261).

4.2 Comparison of risk factors for cardiovascular disease between Islamic and non-Islamic Thais

Part 2: Risk factors for cardiovascular disease (Table 11)

Blood pressure and hypertension

The median blood pressures were 120/77 and 121/76 mmHg in Islamic and non-Islamic groups respectively. There was no statistically significant difference between the 2 groups (p = 0.304 for systolic blood pressure and 0.539 for diastolic blood pressure). About 20% of subjects in the non-Islamic group had blood pressure ≥ 140/90 mmHg, compared to 15% in the Islamic group. However, the difference was not statistically significant (PRR 0.75, 95% CI of PRR 0.48 to 1.15, p = 0.193).Similar proportion of subjects in both groups (about 30%)met the definition of hypertension used in this study (PRR 0.99, 95% CI of PRR 0.72 to 1.35, p = 0.939).

Fasting plasma glucose and diabetes mellitus

Although fasting plasma glucose levels were not statistically significantly different between Islamic and non-Islamic groups, the prevalence of diabetes mellitus was significantly higher in Islamic than in non-Islamic participants (37.4% vs. 23.7%, PRR 1.57, 95% CI of PRR 1.12 to 2.21, p = 0.006).

Body Mass Index

Islamic participants had higher median body mass index (BMI) than non-Islamic participants, and higher proportion of Islamic group had BMI ≥25 kg/m^2 than non-Islamic group. However, these differences were not statistically significant (p = 0.177 for median BMI and 0.223 for proportion of BMI ≥ 25 kg/m^2).

Waist circumference

Median waist circumference was significantly larger in Islamic group than in non-Islamic group in both males and females (males: 87.0 vs. 84.5 cm, p = 0.011; females: 85.0 vs. 80.0 cm, p = 0.028). Proportion of subjects with abnormal waist circumference (≥ 90 cm in males or≥ 80 cm in females) was also higher in Islamic group compared to non-Islamic group, but the difference was not statistically significant (53.0% vs. 43.7%, p = 0.079).

Cholesterol

The median cholesterol among study participants was 199 mg/dl. There was no statistically significant difference between the 2 groups. More subjects in the non-Islamic group had high cholesterol (≥ 240 mg/dl) than in the Islamic group, but the difference was not statistically significantly different (p = 0.201).

Triglyceride

Triglyceride levels in Islamic and non-Islamic subjects were not significantly different (median 139 mg/dl vs. 134 mg/dl, p=0.949). Proportions of subjects with normal, borderline high and high triglyceride levels were also not statistically significantly different between Islamic and non-Islamic groups (p= 0.157).

HDL

The median HDL was46 mg/dl in Islamic group and 47 mg/dl in non-Islamic group, which was not statistically significant (p = 0.532). Islamic subjects had higher proportion of low HDL(HDL < 40 mg/dl) than did non-Islamic subjects (30.7% vs. 24.4%), but the difference was not statistically significant.

LDL

There was no statistically significant difference in LDL between Islamic and non-Islamic participants (122 mg/dl vs. 121 mg/dl, p=0.402). The proportions of subjects in each category of LDL were also not different between the 2 groups (p=0.284).

The metabolic syndrome

About 22% of study participants had the metabolic syndrome. The proportions of metabolic syndrome in the 2 groups were not statistically significantly different (24.8% vs. 17.8%, p = 0.110)

Part 3: Health Behaviors

Exercise Level

Levels of exercise were not significantly different between Islamic and non-Islamic subjects, although Islamic group had less proportion of subjects with high level of exercise than non-Islamic group (23.0% vs. 33.3%, p=0.068).

Smoking

There was no significant difference in proportions of smokers between Islamic and non-Islamic participants (24.1% vs. 28.9%, p=0.296).

Table 4.1 Demographic characteristics of study participants

Variable	Islam n=270		non-Islam n=135		p-value[a]
Gender, n (%)					1.00
Male	124	(45.9)	62	(45.9)	
Female	146	(54.1)	73	(54.1)	
Age (years), n (%)					0.978
35-44	79	(28.1)	39	(28.9)	
45-54	82	(30.4)	39	(28.9)	
55-64	62	(23.0)	33	(24.4)	
≥ 65	50	(18.5)	24	(17.8)	
Median (IQR)	52 (44-61)		52 (44-61)		0.867[b]
Marital status, n (%)					0.074
Married	249	(92.9)	117	(86.7)	
Single/widowed/divorced/separated	21	(7.8)	18	(13.3)	

Abbreviation: n = number, IQR = Interquartile range

[a]Pearson Chi-square test, except where indicated otherwise

[b]Mann-Whitney Utest

Table 4.1 Demographic characteristics of study participants (cont.)

Variable	Islam n=270		non-Islam n=135		p-value[a]
Education, n (%)					0.940
No education	38	(14.1)	16	(11.9)	
Elementary education	142	(52.6)	70	(51.9)	
Secondary education	53	(19.6)	27	(20.0)	
Diploma	9	(3.3)	5	(3.7)	
Bachelor's degree or higher	28	(10.4)	17	(12.6)	
Occupation, n (%)					0.196
Employees of Government / State enterprise / Private business	30	(11.1)	24	(17.8)	
Farmers	183	(67.8)	81	(60.0)	
General laborers /Traders.	21	(7.8)	14	(10.3)	
Retired / Housework	36	(13.3)	16	(11.9)	
Family history of hypertension, diabetes mellitus or stroke, n (%)					0.261
Yes	130	(48.1)	73	(54.1)	
No	140	(51.9)	62	(45.9)	

Abbreviation: n = number, IQR = Interquartile range

[a]Pearson Chi-square test, except where indicated otherwise

[b]Mann-Whitney U test

Table 4.2 Comparison of risk factors for cardiovascular disease between Islamic and non-Islamic Thais

Variable	Islam n=270	non-Islam n=135	PRR (95%CI)	p-value
Systolic blood pressure (mmHg)				0.304[b]
Median (IQR)	120 (112-129)	121 (112-133)		
Diastolic blood pressure (mmHg)				0.539[b]
Median (IQR)	77 (70-84)	76 (70-86)		
Blood pressure category, n (%)				0.193[a]
≥140/90 mmHg	42(15.6)	28(20.7)	0.75 (0.48-1.15)	
<140/90 mmHg	228(84.4)	107 (79.3)	Reference	
Hypertension, n (%)				0.939[a]
Yes	81(30.0)	41(30.4)	0.99 (0.72-1.35)	
No	189(70.0)	94(69.6)	Reference	
Fasting plasma glucose, FPG (mg/dl)				0.319[b]
Median (IQR)	93 (80-109)	90 (80-101)		
FPG category, n (%)				0.342[a]
≥126 mg/dl	23(8.5)	10(7.4)	1.24 (0.61-2.51)	
100-125 mg/dl	68(25.2)	26(19.3)	1.32 (0.88-1.96)	
<100mg/dl	179(66.3)	99(73.3)	Reference	
Diabetes mellitus, n (%)				0.006[a]
Yes	101(37.4)	32(23.7)	1.57 (1.12-2.21)	
No	169(62.6)	103(76.3)	Reference	

Abbreviation: n = number, IQR = Interquartile range, PRR = Prevalence rate ratio, CI = Confidence Interval

[a]Pearson chi-square test , [b]Mann-Whitney U test

Table 4.2 Comparison of risk factors for cardiovascular disease between Islamic and non-Islamic Thais (cont.)

Variable	Islam n=270	non-Islam n=135	PRR (95%CI)	p-value
Body mass index (kg/m^2)				0.177 [b]
Median (IQR)	24.0 (21.5-27.1)	23.1 (21.6-26.1)		
Body mass index category, n (%)				0.223 [a]
≥ 25kg/m^2	116 (43.0)	46(34.1)	1.23 (0.95-1.59)	
23.0-24.9kg/m^2	45(16.7)	25(18.5)	1.04 (0.68-1.57)	
<23.0 kg/m^2	109(40.4)	64 (47.4)	Reference	
Waist circumference (cm) Males				0.011 [b]
Median (IQR)	87 (81-90)	84.5 (80-87)		
Waist circumference (cm) Females				0.028 [b]
Median (IQR)	85 (78-89)	80 (77.5-86)		
Waist circumference category, n (%)				0.079 [a]
Abnormal	143(53.0)	59(43.7)	1.21 (0.97-1.51)	
Normal	127(47.0)	76(56.3)	Reference	

Abbreviation: n = number, IQR = Interquartile range, PRR = Prevalence rate ratio, CI = Confidence Interval

[a]Pearson chi-square test

[b]Mann-Whitney U test

Table 4.2 Comparison of risk factors for cardiovascular disease between Islamic and non-Islamic Thais (cont.)

Variable	Islam n=270	non-Islam n=135	PRR (95%CI)	p-value
Cholesterol (mg/dl)				0.386 [b]
Median (IQR)	198 (180-220)	200 (179-226)		
Cholesterol category, n (%)				0.201 [a]
≥ 240 mg/dl	36(13.3)	27 (20.0)	0.67 (0.43-1.03)	
200-239mg/dl	92(34.1)	45 (33.3)	0.94 (0.71-1.24)	
< 200 mg/dl	142(52.6)	63(46.7)	Reference	
Triglyceride (mg/dl)				0.949 [b]
Median (IQR)	139 (109-170)	134 (110-175)		
Triglyceride category, n (%)				0.157 [a]
≥ 200 mg/dl	23(8.5)	18 (13.3)	0.70 (0.39-1.24)	
150-199 mg/dl	83(30.7)	32(23.7)	1.22 (0.87-1.73)	
<150mg/dl	164(60.7)	85(63.0)	Reference	
HDL (mg/dl)				0.532 [b]
Median (IQR)	46 (36-55)	47 (40-54)		
HDL category, n (%)				0.331 [c]
<40 mg/dl	83(30.7)	33(24.4)	1.06 (0.82-1.36)	
40-59 mg/dl	142(52.6)	81(60.0)	0.95 (0.84-1.08)	
≥ 60 mg/dl	45(16.7)	21(15.6)	Reference	

Abbreviation: n = number, IQR = Interquartile range, PRR = Prevalence rate ratio, CI = Confidence Interval

[a]Pearson chi-square test

[b]Mann-Whitney U test

Table 4.2 Comparison of risk factors for cardiovascular disease between Islamic and non-Islamic Thais (cont.)

Variable	Islam n=270	non-Islam n=135	PRR(95%CI)	p-value
LDL (mg/dl)				0.402 [b]
Median (IQR)	122 (100-142)	121 (107-149)		
LDL category, n (%)				0.289 [a]
≥ 130 mg/dl	112(41.5)	55(40.7)	0.91 (0.75-1.11)	
100-129 mg/dl	88(32.6)	53(39.3)	0.84 (0.68-1.03)	
< 100mg/dl	70(25.9)	27(20.0)	Reference	
The metabolic syndrome				0.110 [a]
Yes	67(24.8)	24(17.8)	1.39 (0.91-2.12)	
No	203(75.2)	111(82.8)	Reference	
Exercise level, n (%)				0.068 [a]
Low (<600 METs-min/week)	80(29.6)	31(23.0)	1.38 (1.01-1.87)	
Moderate (600 – 2,999 METs-min/week)	128 (47.4)	59 (43.7)	1.18 (0.97-1.44)	
High (≥ 3,000 METs-min/week)	62(23.0)	45(33.3)	Reference	
Smoking, n (%)				0.296 [a]
Yes	65(24.1)	39 (28.9)	0.83 (0.81-2.04)	
No	205 (75.9)	96(71.1)	Reference	

Abbreviation: n = number, IQR = Interquartile range, PRR = Prevalence rate ratio, CI = Confidence Interval

[a]Pearson chi-square test

[b]Mann-Whitney U test

4.3 Presence of multiple risk factors for cardiovascular disease

A subject was classified as having multiple risk factors for cardiovascular disease if he or she had 2 or more of the following risk factors: (1) age ≥45 years for males or≥55 years for females); (2) hypertension or blood pressure ≥ 140/90 mmHg; (3) diabetes mellitus or FPG ≥ 126 mg/dl; (4) total cholesterol > 240mg/dl; (5) smoking; and (6) obesity (body mass index > 25 kg/m^2). The proportion of subjects with multiple risk factors for cardiovascular disease was 46.9% and there was no statistically significant difference between Islamic and non-Islamic participants (table 4.3).

Table4.3 Presence of multiple risk factors for cardiovascular disease

	Islam n=270	**non-Islam n=135**	**PRR (95%CI)**	**p-value**
Multiple risk factors for cardiovascular disease, n (%)				0.725[a]
Yes	125(46.3)	65(48.1)	0.96(0.77-1.19)	
No	145(53.7)	70(51.9)	Reference	

Abbreviation: n = number, IQR = Interquartile range, PRR = Prevalence rate ratio, CI = Confidence Interval

[a]Pearson chi-square test

[b]Mann-Whitney U test

CHAPTER V
DISCUSSION

This research is a cross-sectional analytic study with the objective to compare risk factors for cardiovascular disease including hypertension, diabetes mellitus, the metabolic syndrome, dyslipidemia (cholesterol, triglyceride, HDL, LDL), body mass index, and health behaviors, i.e., exercise and smoking habit, between Islamic and non-Islamic Thai adults living in lower southern part of Thailand. The study was conducted with a sample group in Yaha District, Yala Province. Participants are 405 people aged 35 years or older. Subjects are categorized into 2 groups, 270 Islamic Thais and 135 non-Islamic Thais, according to the actual ratio of Islamic to non-Islamic population of 2:1 in Yala Province.

The results of this study are examined to see if the risk factors for cardiovascular disease in people with different religions are different or not. Based on data analysis of the risk factors for cardiovascular disease, the prevalence of diabetes mellitus and the average waist circumference in Islamic Thais are different from those in non-Islamic Thais with statistical significance.

Islamic Thais are found to have a higher prevalence of diabetes mellitus than those who are non-Islamic. This is consistent with a study conducted by Suwatanaviroj T [116] on prevalence of coronary artery disease in difference ethnic groups at a tertiary care hospital. The study was conducted with Muslim and Buddhist Thais. The result revealed that Muslim Thais had higher proportion of diabetes mellitus than Buddhist Thais with a statistical significance. It is also in consistent with a study conducted by Nish Chaturvedi [117] on ethnic differences in cardiovascular disease, which revealed that Muslim in Southern Asia had higher prevalence of diabetes mellitus than Europeans. In addition, it is also consistent with a study from northwest China conducted by Wei Liu., et. al [118] on the prevalence of glucose metabolism disturbances in Chinese Muslims and possible risk factors. It showed that a higher proportion of Muslim Chinese had diabetes mellitus than Hanyi Chinese. It is

also in consistent with a study conducted in Sri Lanka by P Katulanda, at., al [119] on province and ethnic specific prevalence of diabetes among Sri Lankan adults. The study was carried outin4 ethnic groups: Sinhalese, Sri Lanka Tamil, Indian Tamil and Muslim. This study showed that Sri Lanka tamiland Muslim have higher prevalence of diabetes mellitus than other ethnics living in the same area. The authors postulated that the higher prevalence of diabetes mellitus in Muslims in Sri Lanka might be partly explained by the lower levels of physical activities in this group as assessed by IPAQ. The result is as well in consistent with a study conducted by Supoj Ali-Ausaman [120] on health and health care difference among Buddhist Thais and Muslim Thais in Nakornnayok, which revealed higher prevalence of diabetes mellitus inMuslim Thais than in Buddhist Thais. The author explained that diabetes mellitus was more prevalent in Muslim Thais due to inappropriate eating habit and inadequate exercise. There is a supporting research concerning eating and exercise habits of Thai people living in the 3 southern border provinces of Thailand. It was a research on combined cultures of Buddhist, Chinese and Muslim Thais in MuangPattani District, Pattani Province [95]. The study showed that southern Thai cuisine is usually spicy and rich in coconut milk and carbohydrate, especially the local cuisine for Islamic Thais, which usually mostly contains carbohydrate, coconut milk, and oil, such as Chicken Biryani with green chutney, Golek Grilled Chicken, Rojak and Raksa. [121]. Such type of foods can easily cause obesity and various chronic diseases. In addition, Islamic Thais tend to exercise less than non-Islamic Thais. The promotion of physical activities among Islamic Thais has to take into account the way of life and religious practices of Islam [122]. Are search on relationship between belief and exercise behaviors of female Muslim teenager in a private school teaching Islam located in the south of Thailand revealed that belief in the benefits of exercise, perception of the risk of having diseases related to the lack of exercise, and perception of obstacles and things to be concerned about performing exercise according to Islam religion, in terms of attitude and level of knowledge, are ata medium level [101]. In addition, a study on factors affecting health behaviorsin Pattani Province showed a low level of exercise among Islamic religious leaders. Lack of exercise contributes to the development of chronic non-communicable diseases such as obesity, diabetes mellitus and cardiovascular disease [122]. However,a study conducted by Weerasak jongsuwiwatwong,

et.al. [13] on the difference of risk factorsfor cardiovascular disease between genders and ethnics in Songkhla, based on data collected from Inter ASIA-South,found that the prevalence of diabetes mellitus was not different between Muslim and Buddhist subjects.

This study also reveals statistically significant difference in the average waist circumference. Islamic Thais have higher average waist circumference than non-Islmic Thais in both males and females. This is in consistence with a study conducted by Thada Yibintsoi, et.al. [12] on the prevelence of risk factors of cardiovascular disease in lower southern part of Thailand comparing between different ethnics (Budhists Thais and Muslim Thais) in Thepha District, Songkhla. The average waist circumference is found to be different, especially in females. Muslim females have higher avarage waist circumference than Buddhist females. This also conforms to a study in Sri Lanka conducted by P Katulanda, et. al.[119], which found that Muslim had higher waist circumference than Sinhalese and Tamils in Sri Lanka.

Regarding lipid profiles, this study did not find significant difference in total cholesterol, HDL-cholesterol, LDL-cholesterol, and triglyceride between Islamic and non-Islamic subjects. In other studies conducted in Songkhla province, Muslim Thais were significantly more likely to have low HDL-cholesterol compared to Buddhist Thais living in the same areas [12, 13].

Strength of the study

This study is a population-based study. Sampling processes were design to ensure that the study participants were a representative sample of the target population.

Limitations of the study

Data collection was carried out by many health personnel from each participating health center. This could potentially result in some degree of interviewer bias, especially for subjects who could not provide data through self-administered

questionnaire. However, the majority of subjects could administer the questionnaire by themselves.

Although the study used stratified random sampling technique in subject selection, those who agreed to participate might still be somewhat more health-concerned than those who declined, thereby resulting in healthy volunteer bias. The extent to which this type of bias affects the validity of the study depends on the disparity of concern in health between Islamic and non-Islamic participants.

This study did not examine many important risk factors for cardiovascular disease such as eating habit, nutrition, alcohol consumption, stress and the presence of hyperlipidemia. Eating habit and nutrition are difficult to measure accurately. Alcohol consumption can be measured only in non-Islamic subjects; Muslims are prohibited from alcohol consumption according to the religious principle of Islam. Even though some of them might actually drink alcohol but they might not want to disclose that information, thus the data received may not be correct.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

This study is comparison study of each risk factors of cardiovascular disease in a province located in the lower southern part of Thailand. The study is Cross-sectional analytic study between Islamic Thais and non-Islamic. Data is collected by interview and health checks up the sample individually. Research result can be concluded as follow:

Conclusion

This study aims to compare hypertension, diabetes mellitus, metabolic syndrome, body mass index, waist circumference, dyslipidemia, lack exercise, and smoking in Islamic Thais and non-Islamic Thais in Yala. Risk factors are found to be different with statistical significance. Including diabetes mellitus in Islamic Thais comparing to those who are non-Islamic is different with statistical difference ($p=0.006$). It is found that Islamic Thais is at the risk of having diabetes mellitus for 1.5 times comparing to non-Islamic Thais. And the size of waist circumference, both male and female of Islamic Thais comparing to those who are non-Islamic is statistical difference ($p = 0.011$, $p = 0.028$). Mean of waist circumference both male and female of Islamic Thais is found to be larger than Non-Islamic Thais. Islamic Thais and those who are non-Islamic have different risk factors of cardiovascular disease, not only because of different religion but also because of lifestyle such as exercise are different. As a result, cardiovascular diseases are different.

Recommendation

Data obtained from this research reveals that more number of Islamic Thais have diabetes mellitus than those who are non-Islamic. This result can be further analyzed to determine the cause of disease in order to find a way to solve the health problem accurately.

To study the risk of Cardiovascular Disease is response to the policy of strong disease prevention district of Disease Control Department, which is focusing on the evaluation of the risk factors of Cardiovascular Disease in the publics [123]. Data can be used in the planning of campaign and the implementation of surveillance, prevention, and control of non-communicate disease (NCD) in the area with similar context with the samples.

Data can also explain the risk factor of cardiovascular disease categorized by religion.

The teaching media should be in Malay and local southern Thai language in order to be able to get access to every group of people and also being a health promoting media that people understand and can use.

Further research

There should be a prospective cohort study which is a long term study on sample of Islamic Thais and non-Islamic in order to determine main cause of cardiovascular disease by using every risk factors used in this study.

There should be a comparison study between Islamic Thais in lower southern of Thailan and non-Islamic Thais in other region of Thailand or between Islamic Thais living in different regions because their lifestyle might be different. Other health behavior which is a risk factor of non – communicable disease can be studied as well.

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THE OPTIMAL CUT-OFF POINTS OF BODY MASS INDEX WHICH REFLECT THE RISK FACTORS OF CARDIOVASCULAR DISEASE IN URBAN THAI MALE POPULATION วิทยานิพนธ์มหาบัณฑิต. วิทยาศาสตร์ (โภชนวิทยา)มหาวิทยาลัยมหิดล. บัณฑิตวิทยาลัย 2548

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APPENDICES

APPENDIX A
INTERVIEW

A study of risk factors for cardiovascular disease in people in a province in southern part of Thailand

Description

This questionnaire is a part of the thesis for master degree of epidemiological science, Faculty of Siriraj Medical science, Mahidol University. The research a study of risk factors for cardiovascular disease in people in a province in southern part of Thailand. To identify the risk of having Cardiovascular Disease in Islamic Thais and non-Islamic Thais whose age is 35 years old and older by interviewing and conducting health check up in order to get health information about the prevalence of Cardiovascular Disease. As you are the staff of public health service, I would like you to answer this questionnaire completely according to the fact. I guarantee that your answers will be confidential and it will be presented as general results which cannot be treated back to a corresponding individual.

There are 3 parts of this questionnaire.
Part 1 General demographic characteristics
Part 2 Risk factor for cardiovascular disease
Part 3 Health Behavior

I would very appreciate for your kind consideration and participation in this study.

Part 1 General demographic characteristics

Description: Please remark ✓in the box ☐ or fill up the word into the blanks.

1. Sex ☐ 1 Male ☐ 2 Female

2. Age .....year old

3. Religion ☐1 Buddhism ☐2 Islamic ☐2 Other religions identified.....

4. Marital status

☐1 Single ☐2 Marry (Marriage registration may be or not)

☐3 Separated ☐4 Widowed ☐5 Divorced

5. Education

☐1 Uneducated

☐2 Elementary education

☐3 Secondary school

☐4 High school

☐5 Diplomas

☐6 Bachelor Degree

☐7 Postgraduate

☐8 The only study religion

6. Occupation

☐1 Government officials, employees, employees of government agencies.

☐2 Employees, employees of state enterprises

☐3 Private companies

☐4 Business owners, Self employed

☐5 farmers

☐6 general Contractors

☐7 commercial

☐8 Livestock

☐9 Students

☐10 Retirements

☐11 Unemployment

☐12 others please specify.....

7. Family history of illness

7.1 Family members, including his parents, brothers, sisters with hypertension disease.

☐1 Yes ☐2 No ☐3 unknown

7.2 Family members, including his parents, brothers, sisters with diabetes disease.

☐1 Yes ☐2 No ☐3 unknown

7.3 Family members, including his parents, brothers, sisters cardiovascular disease.

☐1 Yes ☐2 No ☐3 unknown

7.4 Family members, including his parents, brothers, sisters a stroke.

☐1 Yes ☐2 No ☐3 unknown

Part 2 Risk factor for cardiovascular disease

1. Hypertension

1.1 You have been diagnosed with hypertension or not.

☐1 Yes ☐2 No ☐3 unknown

1.2 Are you currently taking medication for the treatment of with hypertension or not.

☐1 Yes ☐2 No ☐3 unknown

1.3 Results of blood pressure

Blood pressure.....mmHg

Blood pressure.....mmHg

Blood pressure.....mmHg

2. Diabetes mellitus

2.1 You have been diagnosed with diabetes mellitus or not

☐1 Yes ☐2 No ☐3 unknown

2.2 Are you currently taking medication for the treatment of with diabetes mellitus or not.

☐1 Yes ☐2 No ☐3 unknown

2.3 Blood glucose levels..... mg/dl

3. Body mass index (BMI)

3.1 Height.....cm

3.2 Weight.....kg

3.3 Body mass index (BMI)..... Kg / m^2

4. Waist circumference size

4.1 Waist circumference.....cm (Measure navel area)

5. Lipid profile

5.1 Total Cholesterol (TC).....mg/dl

5.2 Triglyceride (TG).....mg/dl

5.3 High density lipoprotein (HDL-C)..... mg/dl

5.4 Low density lipoprotein (LDL-C)..... mg/dl

Part 3 Health Behavior

6. Exercise behavior and lifestyle.

6.1 During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time

☐1 No walking (***Skip to question 6.3)***

☐2 ..... days per week

6.2 How much time did you usually spend on one of those days doing vigorous physical activities as part of your work?

☐1..... hours per day

☐2..... Minutes per day

☐3 Don't know/Not sure

6.3 Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads as part of your work? Please do not include walking.

☐1 No walking (***Skip to question 6.5)***

☐2 ..... days per week

6.4 How much time did you usually spend on one of those days doing moderate physical activities as part of your work?

☐1..... hours per day

☐2..... Minutes per day

☐3 Don't know/Not sure

6.5 Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure

☐1 No walking (***Skip to question 6.7)***

☐2 ..... days per week

6.6 How much time did you usually spend walking on one of those days?

☐1..... hours per day

☐2..... Minutes per day

☐3 Don't know/Not sure

6.7 The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television. During the last 7 days, how much time did you spend sitting on a week day?

☐1..... hours per day

☐2..... Minutes per day

☐3 Don't know/Not sure

7. Cigarette smoking habit

7.1 Are you currently smoke?

☐1 Smoke (Skip to question 7.4) ☐2 Non-smoke

7.2 In the past you used to smoke?

☐1 Smoke ☐2 Non-smoke

7.3 How long have you quit smoking?

Smoking Cessation.....year..... Month

7.4 The average amount of smoking..... Cigarettes per day

The average amount of smoking..... Cigarettes per week

แบบสัมภาษณ์
การศึกษาปัจจัยเสี่ยงโรคหัวใจและหลอดเลือดในประชาชนจังหวัดหนึ่งในภาคใต้ตอนล่าง

คำชี้แจง

แบบสัมภาษณ์นี้ เป็นส่วนหนึ่งของการศึกษาหลักสูตร วิทยาศาสตรมหาบัณฑิต สาขาวิทยาการระบาด คณะแพทยศาสตร์ ศิริราชพยาบาล มหาวิทยาลัยมหิดล มีวัตถุประสงค์เพื่อเปรียบเทียบปัจจัยเสี่ยงต่อโรคหัวใจและหลอดเลือดใน คนไทยนับถือศาสนาอิสลามและคนไทยที่ไม่ได้นับถือศาสนาอิสลาม ของประชาชนอายุ 35 ปีขึ้นไป จังหวัดยะลา สามารถนำผลการวิจัยไปใช้ประโยชน์การวางแผนการดำเนินงานทางด้านงานสาธารณสุข และวางแผนการจัดบริการสาธารณสุขด้านการควบคุมป้องกันโรคไม่ติดต่อ การส่งเสริมสุขภาพ ของประชาชนกลุ่มที่มีปัจจัยเสี่ยงความสัมพันธ์ต่างๆ ในระยะเริ่มแรกเพื่อสามารถควบคุมป้องกันโรคได้อย่างมีประสิทธิภาพ จึงใคร่ขอความร่วมมือจากทุกท่าน ได้กรุณาตอบแบบสัมภาษณ์นี้ตามความเป็นจริง และตอบให้ครบทุกข้อ เพื่อจะได้นำผลไปใช้ประโยชน์ดังกล่าว ผู้วิจัยขอรับรองว่า ข้อมูลที่ท่านตอบให้ทั้งหมดแต่ละคน จะถือเป็นความลับ และจะนำเสนอผลการวิจัยในภาพรวมเท่านั้น

แบบสอบถามฉบับนี้ มี 3 ส่วน ประกอบด้วย
ส่วนที่ 1 ข้อมูลทั่วไป
ส่วนที่ 2 ปัจจัยเสี่ยงโรคหัวใจและหลอดเลือด
ส่วนที่ 3 พฤติกรรมสุขภาพ

ผู้วิจัยขอขอบคุณประชาชนทุกท่านที่ให้ความร่วมมือเป็นอย่างดี มา ณ โอกาสนี้

ส่วนที่ 1 ข้อมูลทั่วไป

คำชี้แจง โปรดทำเครื่องหมาย ✓ ลงใน☐ หน้าข้อความที่เป็นคำตอบของท่าน

1. เพศ ☐ 1 ชาย ☐ 2 หญิง

2. อายุ .....ปี

3. ศาสนา ☐1 ศาสนาพุทธ ☐2 ศาสนาอิสลาม ☐2 ศาสนาอื่นๆระบุ.....

4. สถานภาพสมรส

☐1 โสด ☐2 สมรส/อยู่กินฉันท์สามีภรรยา (อาจจดทะเบียนหรือไม่ก็ได้)

☐3 แยกกันอยู่ ☐4 หม้าย ☐5 หย่า

5. ระดับการศึกษา

☐1 ไม่ได้รับการศึกษา ☐6 อนุปริญญา

☐2 ประถมศึกษา ☐7 ปริญญาตรี

☐3 มัธยมศึกษาตอนต้น ☐8 สูงกว่าปริญญาตรี

☐4 มัธยมศึกษตอนปลาย/ปวช. ☐9 เรียนศาสนาอย่างเดียว

☐5 ประกาศนียบัตรวิชาชีพชั้นสูง

6. อาชีพ

☐1 ข้าราชการ, พนักงาน, ลูกจ้างหน่วยงานของรัฐ ☐7 ค้าขาย

☐2 พนักงาน, ลูกจ้างของรัฐวิสาหกิจ ☐8 ปศุสัตว์, เลี้ยงสัตว์

☐3 พนักงานบริษัทเอกชน ☐9 นักเรียน/นิสิต, นักศึกษา

☐4 เจ้าของกิจการ, ธุรกิจส่วนตัว ☐10 เกษียณ/แม่บ้าน/พ่อบ้าน

☐5 เกษตรกร ☐11 ว่างงาน/ไม่มีงานทำ

☐6 รับจ้างทั่วไป ☐12 อื่นๆระบุ.....

7. ประวัติการเจ็บป่วยของคนในครอบครัว

7.1 มีบุคคลในครอบครัว ได้แก่ พ่อ แม่ พี่ น้อง ป่วยเป็นโรคความดันโลหิตสูง

☐1 มี ☐2 ไม่มี ☐3 ไม่ทราบ

7.2 มีบุคคลในครอบครัว ได้แก่ พ่อ แม่ พี่ น้อง ป่วยเป็นโรคเบาหวาน

☐1 มี ☐2 ไม่มี ☐3 ไม่ทราบ

7.3 มีบุคคลในครอบครัว ได้แก่ พ่อ แม่ พี่ น้อง ป่วยเป็นโรคหลอดเลือดหัวใจ

☐1 มี ☐2 ไม่มี ☐3 ไม่ทราบ

7.4 มีบุคคลในครอบครัว ได้แก่ พ่อ แม่ พี่ น้อง ป่วยเป็นโรคหลอดเลือดสมอง (อัมพฤกษ์/อัมพาต)

☐1 มี ☐2 ไม่มี ☐3 ไม่ทราบ

ส่วนที่ 2 ปัจจัยเสี่ยงต่อโรคหัวใจและหลอดเลือด

1. โรคความดันโลหิต

1.1 ท่านได้รับการวินิจฉัยว่าเป็นโรคความดันโลหิตสูงหรือไม่

☐1 เป็น ☐2 ไม่เป็น ☐3 ไม่ทราบ

1.2 ปัจจุบันท่านได้รับยาเพื่อการรักษาโรคความดันโลหิตสูงหรือไม่

☐1 ได้รับ ☐2 ไม่ได้รับ ☐3 ไม่ทราบ

1.3 ผลการตรวจความดันโลหิต

ครั้งที่ 1 ค่าความดันโลหิต.....มิลลิเมตรปรอท

ครั้งที่ 2 ค่าความดันโลหิต.....มิลลิเมตรปรอท

ครั้งที่ 3 ค่าความดันโลหิต.....มิลลิเมตรปรอท

2. โรคเบาหวาน

2.1 ท่านได้รับการวินิจฉัยว่าเป็นโรคเบาหวานหรือไม่

☐1 เป็น ☐2 ไม่เป็น ☐3 ไม่ทราบ

2.2 ปัจจุบันท่านได้รับยาเพื่อการรักษาโรคเบาหวานหรือไม่

☐1 ได้รับ ☐2 ไม่ได้รับ ☐3 ไม่ทราบ

2.3 ค่าระดับน้ำตาลในเลือด.....มิลลิกรัมต่อเดซิลิตร

3. ดัชนีมวลกาย (BMI)

3.1 ส่วนสูง.....เซนติเมตร

3.2 น้ำหนัก.....กิโลกรัม

3.3 ค่าดัชนีมวลกาย (BMI).....กิโลกรัม/ตารางเมตร

4. ขนาดรอบเอว

4.1 รอบเอว.....เซนติเมตร (วัดบริเวณสะดือ)

5. ภาวะไขมันในเลือด

5.1 ระดับTotal Cholesterol (TC).....mg/dl

5.2 ระดับTriglyceride (TG).....mg/dl

5.3 ระดับHigh density lipoprotein (HDL-C)..... mg/dl

5.4 ระดับLow density lipoprotein (LDL-C)..... mg/dl

ส่วนที่ 3 พฤติกรรมสุขภาพ

6. พฤติกรรมการออกกำลังกายและรูปแบบการดำเนินชีวิต

6.1 โดยปกติในช่วง 7 วัน (1 สัปดาห์) ท่านได้ทำกิจกรรมที่ต้องออกแรงมาก หรือ ออกกำลังกายหนักจนทำให้รู้สึกเหนื่อยมาก หายใจแรงและลึกหรือหัวใจเต้นเร็วและแรงมากขึ้น เช่น ขุดดิน ยกของหนัก เต้น แอโรบิก ขี่จักรยานเร็วๆ วิ่งเร็วๆ

โดยกระทำอย่างต่อเนื่องเป็นเวลาตั้งแต่ 10 นาทีขึ้นไป

☐1 ไม่มี (ข้ามไปตอบข้อ 6.3)

☐2 มี โดย.....วัน/สัปดาห์

6.2 โดยเฉลี่ย ท่านใช้เวลานานใด ในการทำกิจกรรม ที่ต้องออกแรงมาก หรือ ออกกำลังกายหนัก

☐1.....ชั่วโมง/วัน

☐2.....นาที/วัน

☐3ไม่ทราบ/ไม่แน่ใจ

6.3 โดยปกติในช่วง 7 วัน (1 สัปดาห์) ท่านได้ทำกิจกรรมที่ต้องออกแรงปานกลาง หรือออกกำลังกายปานกลาง จนทำให้รู้สึกเหนื่อยพอประมาณหรือพอสมควร หายใจแรงกว่าปกติ เช่น ยกของที่ไม่หนักมาก กวาดบ้าน ถูบ้าน ขี่จักรยานไปเรื่อยๆ วิ่งเหยาะๆ แบดมินตัน

โดยกระทำอย่างต่อเนื่องเป็นเวลาตั้งแต่ 10 นาทีขึ้นไป

☐1 ไม่มี (ข้ามไปตอบข้อ 6.5)

☐2 มี โดย.....วัน/สัปดาห์

6.4 โดยเฉลี่ย ท่านใช้เวลานานเท่าใด ในการทำกิจกรรม ที่ต้องออกแรงปานกลาง หรือออกกำลังกายปานกลาง

☐1.....ชั่วโมง/วัน

☐2.....นาที/วัน

☐3ไม่ทราบ/ไม่แน่ใจ

6.5 โดยปกติในช่วง 7 วัน (1 สัปดาห์) ท่านมีการเดิน ซึ่งรวมถึงการเดินในบ้าน ที่ทำงาน และการเดินจากที่หนึ่งไปอีกที่หนึ่ง เช่น เดินไปซื้อของ เดินเล่นที่สนามหญ้าหรือสวนสาธารณะ

โดยกระทำอย่างต่อเนื่องเป็นเวลาตั้งแต่ 10 นาทีขึ้นไป

☐1 ไม่มี (ข้ามไปตอบข้อ 6.7)

☐2 มี โดย.....วัน/สัปดาห์

6.6 โดยเฉลี่ย ท่านใช้เวลาในการเดินนานเท่าใด

☐1.....ชั่วโมง/วัน

☐2.....นาที/วัน

☐3 ไม่ทราบ/ไม่แน่ใจ

6.7 ในระยะเวลาช่วง 7 วัน (1 สัปดาห์) ท่านนั่งทำกิจกรรม รวมถึงนั่งทำการบ้าน นั่งคุยกับเพื่อนๆ นั่งอ่านหนังสือ และนั่งดูโทรทัศน์

ท่านนั่งทำกิจกรรม โดยเฉลี่ยต่อวัน นานเท่าใด

☐1.....ชั่วโมง/วัน

☐2.....นาที/วัน

☐3 ไม่ทราบ/ไม่แน่ใจ

7. พฤติกรรมการสูบบุหรี่

7.1 ปัจจุบันท่านสูบบุหรี่หรือไม่

☐1 สูบ (ข้ามไปตอบข้อ 7.4) ☐2 ไม่สูบ

7.2 ในอดีตท่านเคยสูบบุหรี่หรือไม่

☐1 สูบ ☐2 ไม่สูบ

7.3 ปัจจุบันท่านเลิกสูบบุหรี่มานานเท่าไร

เลิกสูบบุหรี่.....ปี.....เดือน

7.4 ปริมาณการสูบบุหรี่เฉลี่ย.....มวนต่อวัน หรือ

ปริมาณการสูบบุหรี่เฉลี่ย.....มวนต่อสัปดาห์

APPENDIX B

The list of variables

ตัวแปร	ชนิดตัวแปร	ค่าที่เป็นไปได้	วิธีการวัดและเกณฑ์ในการอ่าน
1. เพศ	Category (Nominal scale)	- ชาย - หญิง	- แบบสัมภาษณ์ - บัตรประจำตัวประชาชน
2. อายุ	Continuous (Ratio scale)	35 ปีขึ้นไป	- แบบสัมภาษณ์ - บัตรประจำตัวประชาชน - การวิเคราะห์ จัดแบ่งช่วงอายุ ช่วงละ 10 ปี คือ 35-44,45-54,55-64,…75-84
3. ศาสนา	Category (Nominal scale)	- ศาสนาพุทธ - ศาสนาอิสลาม - ศาสนาคริสต์	- แบบสัมภาษณ์ เกณฑ์ในการอ่านผล ศาสนาพุทธ, อิสลาม,คริสต์, อื่น.....
4. การศึกษา	Category (Ordinal scale)	- ไม่ได้รับการศึกษา - ประถมศึกษา - มัธยมศึกษาตอนต้น - มัธยมศึกษาตอนปลาย/ปวช. - ประกาศนียบัตรวิชาชีพชั้นสูง - อนุปริญญา - ปริญญาตรี - สูงกว่าปริญญาตรี - เรียนศาสนาอย่างเดียว	- แบบสัมภาษณ์ - ระดับการศึกษา ชั้นปีที่เรียนสูงสุด เกณฑ์ในการอ่านผล ไม่ได้รับการศึกษา ประถมศึกษา มัธยมศึกษาตอนต้น มัธยมศึกษาตอนปลาย/ปวช. ประกาศนียบัตรวิชาชีพชั้นสูง อนุปริญญา/ปวส. ปริญญาตรี สูงกว่าปริญญาตรี เรียนศาสนาอย่างเดียว

The list of variables (cont.)

ตัวแปร	ชนิดตัวแปร	ค่าที่เป็นไปได้	วิธีการวัดและเกณฑ์ในการอ่าน
5. สถานภาพสมรส	Category (Nominal scale)	- โสด - สมรส/อยู่กินฉันท์สามีภรรยา (อาจจดทะเบียนหรือไม่ก็ได้) - หม้าย - หย่า - แยกกันอยู่	- แบบสัมภาษณ์ สถานภาพสมรส เกณฑ์ในการอ่านผล - โสด ได้แก่ ผู้ที่ยังไม่เคยสมรส - สมรส ได้แก่ ผู้ที่อยู่ร่วมกันฉันท์สามีภรรยา ไม่ว่าจะได้ทำการสมรสกันถูกต้องตามกฎหมายหรือไม่ก็ตาม (1) สมรสและคู่สมรสอยู่ในครัวเรือนเดียวกัน หมายถึง สามีและภรรยาที่อาศัยอยู่ในครัวเรือนเดียวกัน (2) สมรสแต่คู่สมรสไม่ได้อยู่ในครัวเรือนเดียวกัน หมายถึง สามีและภรรยาที่อาศัยอยู่คนละครัวเรือนแต่ยังมีความผูกพันฉันท์สามีภรรยากัน - หม้าย ได้แก่ ผู้ที่คู่สมรสได้ตายไปแล้ว และขณะนี้ยังไม่ได้สมรสใหม่ - หย่า ได้แก่ สามีภรรยาที่จดทะเบียนหย่าต่อนายทะเบียนถือว่าถูกต้องตามกฎหมาย เพื่อให้ความเป็นสามีภรรยาสิ้นสุดลง - แยกกันอยู่ ได้แก่ ผู้ที่มิได้อยู่ร่วมกันฉันท์สามีภรรยาแล้ว แต่ยังไม่ได้หย่ากันตามกฎหมาย รวมทั้งผู้ที่ไม่ได้สมรสอย่างถูกต้องตามกฎหมาย แต่ไม่ได้อยู่ร่วมกันฉันท์สามีภรรยาแล้ว

The list of variables (cont.)

ตัวแปร	ชนิดตัวแปร	ค่าที่เป็นไปได้	วิธีการวัดและเกณฑ์ในการอ่าน
6. อาชีพ	Category (Nominal scale)	- ข้าราชการ, พนักงาน, ลูกจ้างหน่วยงานของรัฐ - พนักงาน, ลูกจ้างของรัฐวิสาหกิจ - พนักงานบริษัทเอกชน - เจ้าของกิจการ, ธุรกิจส่วนตัว - เกษตรกร - รับจ้างทั่วไป - ค้าขาย - ปศุสัตว์, เลี้ยงสัตว์ - นักเรียน/นิสิต, นักศึกษา - เกษียณ/แม่บ้าน/พ่อบ้าน - ว่างงาน/ไม่มีงานทำ - อื่นๆระบุ.....	- แบบสัมภาษณ์ เกณฑ์ในการอ่านผล ประกอบอาชีพ (1) ข้าราชการ, พนักงาน, ลูกจ้างหน่วยงานของรัฐ (2) พนักงาน, ลูกจ้างของรัฐวิสาหกิจ (3) พนักงานบริษัทเอกชน (4)เจ้าของกิจการ, ธุรกิจส่วนตัว (5) เกษตรกร (6) รับจ้างทั่วไป (7) ค้าขาย (8) ปศุสัตว์, เลี้ยงสัตว์ (9) นักเรียน/นิสิต, นักศึกษา (10) เกษียณ/แม่บ้าน/พ่อบ้าน (11) ว่างงาน/ไม่มีงานทำ (12) อื่นๆระบุ.....

The list of variables (cont.)

ตัวแปร	ชนิดตัวแปร	ค่าที่เป็นไปได้	วิธีการวัดและเกณฑ์ในการอ่าน
7. ประวัติการเจ็บป่วยของคนในครอบครัว	Category (Nominal scale)	- มี - ไม่มี - ไม่ทราบ	- แบบสัมภาษณ์ เกณฑ์ในการอ่านผล - มีบุคคลในครอบครัว ได้แก่ พ่อ แม่ พี่ น้อง ป่วยเป็นโรคความดันโลหิตสูง - มีบุคคลในครอบครัว ได้แก่ พ่อ แม่ พี่ น้อง ป่วยเป็นโรคเบาหวาน - มีบุคคลในครอบครัว ได้แก่ พ่อ แม่ พี่ น้อง ป่วยเป็นโรคหลอดเลือดหัวใจ - มีบุคคลในครอบครัว ได้แก่ พ่อ แม่ พี่ น้อง ป่วยเป็นโรคหลอดเลือดสมอง(อัมพฤกษ์/อัมพาต)
8. Hypertension	- Category (Nominal scale) - Category (Ordinal scale)	- เป็น - ไม่เป็น - ไม่ทราบ - ค่าความดันโลหิต .....mmHg	- แบบสัมภาษณ์ - ตรวจวัดความดันโลหิต เกณฑ์ในการอ่านผล ปกติ <120/<80 Pre hypertension 120-139/80-89 Stage 1 140-159/90-99 Stage 2 ≥160/≥100
9. Diabetes mellitus	- Category (Nominal scale)	- เป็น - ไม่เป็น - ไม่ทราบ	- แบบสัมภาษณ์ - การตรวจวัดระดับน้ำตาลในเลือด เกณฑ์ในการอ่านผล

The list of variables (cont.)

ตัวแปร	ชนิดตัวแปร	ค่าที่เป็นไปได้	วิธีการวัดและเกณฑ์ในการอ่าน
	- Category (Ordinal scale)	- ค่าระดับน้ำตาลในเลือด.....มก./ดล.	FPG <100 มก./ดล. ปกติ FPG100-125 มก./ดล.IFG FPG≥126 มก./ดล. DM
10. ดัชนีมวลกาย (BMI)	- Continuous (Ratio scale)	- Underweight - Normal weight - Over weight - Pre-Obese - Obese ระดับ 1 - Obese ระดับ 2	- แบบสัมภาษณ์ - การตรวจสุขภาพ ชั่งน้ำหนัก วัดส่วนสูง และนำมาคำนวณค่า BMI [น้ำหนัก (กก.)/ส่วนสูง(เมตร ^{2})] แบ่งช่วง BMI ได้แก่ - <18.5 กก./เมตร^2 - 18.5-22.99 กก./เมตร^2 - ≥ 23 กก./เมตร^2 - 23-24.99 กก./เมตร^2 - 25 – 29.99 กก./เมตร^2 - ≥ 30 กก./เมตร^2
11. เส้นรอบเอว	Continuous (Ratio scale)	1) ผู้หญิงมากกว่าหรือเท่ากับ 80 เซนติเมตร 2) ผู้ชายมากกว่าหรือเท่ากับ 90 เซนติเมตร	- แบบสัมภาษณ์ - การตรวจสุขภาพ (1) ผู้หญิงมากกว่าหรือเท่ากับ 80 เซนติเมตร (2) ผู้ชายมากกว่าหรือเท่ากับ 90 เซนติเมตร เกณฑ์ในการอ่านผล วิธีการวัด บริเวณสะดือ
12. ภาวะไขมันในเลือด	- Category (Ordinal scale)	<u>Total cholesterol</u> - เหมาะสม - เริ่มสูง - สูง <u>Triglyceride</u>	- การตรวจสุขภาพ เกณฑ์ในการอ่านผล <u>Total cholesterol</u> - <200 เหมาะสม - 200-239 เริ่มสูง

The list of variables (cont.)

ตัวแปร	ชนิดตัวแปร	ค่าที่เป็นไปได้	วิธีการวัดและเกณฑ์ในการอ่าน
		- เหมาะสม - เริ่มสูง - สูง - สูงมาก HDL - ต่ำ - ปานกลาง - สูง LDL - เหมาะสม - ใกล้เคียงค่าเหมาะสม(ยอมรับได้) - เริ่มสูง - สูง - สูงมาก	- ≥240 สูง Triglyceride - <150 เหมาะสม - 150-199 เริ่มสูง - 200-499 สูง - ≥500 สูงมาก HDL - <40 ต่ำ - 40-59 ปานกลาง - ≥ 60 สูง LDL - <100 เหมาะสม - 100-129 ใกล้เคียงค่าเหมาะสม (ยอมรับได้) - 130-159 เริ่มสูง - 160-189 สูง - ≥ 190 สูงมาก

The list of variables (cont.)

ตัวแปร	ชนิดตัวแปร	ค่าที่เป็นไปได้	วิธีการวัดและเกณฑ์ในการอ่าน
13. Metabolic syndrome	Category (Nominal scale)	- เป็น - ไม่เป็น	- แบบสัมภาษณ์ เกณฑ์ในการอ่านผล เกณฑ์สำหรับคนเอเชีย อ้างอิงเกณฑ์ของการประชุมร่วมกันระหว่างสมาพันธ์เบาหวานนานาชาติ (International Diabetes Federation (IDF)), National Heart,Lung,and Blood Institute (NHLBI),American Heart Association (AHA) ต้องมีความผิดปกติอย่างน้อย 3 ใน 5 ข้อ [70] ดังต่อไปนี้ 1.มีเส้นรอบเอวตั้งแต่ 90 เซนติเมตรขึ้นไปในเพศชาย และตั้งแต่ 80 เซนติเมตรขึ้นไปในเพศหญิง 2.Triglyceride>150mg/dl1.7mmol/L) 3.HDL-Cholesterol<40mg/dl (1.03 mmol/L)ในผู้ชายและ<50 mg/dl(1.29 mmol/L) ในผู้หญิง 4.Systolicblood pressure>130 mmHg หรือ Diastolic blood pressure>85 mmHg 5. Fasting blood pressure>100 mg/dl (5.6 mmol/L)

The list of variables (cont.)

ตัวแปร	ชนิดตัวแปร	ค่าที่เป็นไปได้	วิธีการวัดและเกณฑ์ในการอ่าน
14. การออกกำลังกาย	Category (Nominal scale) Discrete (Ratio scale) Continuous (Ratio scale)	1) การกระทำกิจกรรม - มี - ไม่มี 2) จำนวนวันที่ทำกิจกรรมในช่วง 7 วันที่ผ่านมา 3) ระยะเวลาโดยเฉลี่ยในแต่ละวันที่ทำกิจกรรม	- แบบสัมภาษณ์พฤติกรรมการออกกำลังกายโดยผู้ตอบแบบสอบถามตอบคำถามตามความเป็นจริงในช่วง 7 วันที่ผ่านมา - แบบสอบถาม มีทั้งหมด 7 ข้อการคำนวณพลังงาน และเกณฑ์การอ่านผลใช้ตามแบบวัดของ IPAQ ออกกำลังกายน้อย..... ออกกำลังกายปานกลาง..... ออกกำลังกายมาก.....
15. การสูบบุหรี่	Category (Nominal scale) Continuous (Ratio scale)	- สูบบุหรี่ -ไม่สูบบุหรี่ - เลิกสูบบุหรี่มานานเท่าไร....ปี.....เดือน - ปริมาณการสูบบุหรี่เฉลี่ย.....มวนต่อวัน - ปริมาณการสูบบุหรี่เฉลี่ย.....มวนต่อสัปดาห์	- แบบสัมภาษณ์ (1) ปัจจุบันท่านสูบบุหรี่หรือไม่ 1 สูบ 2 ไม่สูบ (2) ในอดีตท่านเคยสูบบุหรี่หรือไม่ 1 สูบ 2 ไม่สูบ ท่านเลิกสูบบุหรี่มานานเท่าไร (เดือน) ปริมาณการสูบบุหรี่ต่อวัน ปริมาณการสูบบุหรี่ต่อสัปดาห์

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