DIABETES AND IMPAIRED FASTING GLUCOSE AMONG BUDDHIST MONKS IN CHANTHABURI PROVINCE: PREVALENCE AND ASSOCIATED RISK FACTORS

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ABSTRACT

Diabetes (DM) and its associated complications is a major health problem for Thai people, including Buddhist monks. This cross-sectional study aimed to estimate the prevalence of DM and impaired fasting glucose (IFG) and factors associated with DM among the Buddhist monks in Chanthaburi Province. A total of 415 Buddhist monks aged 35 years and over were randomly sampled.Data were collected by self-administered questionnaire. A fasting capillary whole blood specimen was collected for glucose measurement.

The prevalence of DM was 10.8%, 2.8 % treated DM and 8.0% screened DM. The prevalence of IFG was 11.8%. Multiple logistic regression analysis revealed 5 factors were significantly associated with DM: longer ordination duration; having raised systolic blood pressure; practicing alms-gathering; drinking tea/bottled tea 0-3 day/week; and having unacceptable DM knowledge. Screening for DM needs to be regularly done for early detection and treatment. Continued effective lifestyle modification intervention including increasing physical activities, proper diet; and updating Buddhist monks' DM knowledge are recommended. Continued education for lay people about offering healthy food such as low fat, high-fiber, not-too-sweet fruits and vegetables to the Buddhist monks is also essential.

KEY WORDS: PREVALENCE/ RISK FACTORS/ BUDDHIST MONKS/ DIABETES/ IMPAIRED FASTING GLUCOSE

91 pages

โรคเบาหวาน และ ภาวะที่มีความผิดปกติของระดับน้ำตาลในเลือดที่เสี่ยงต่อการเกิดโรคเบาหวาน ในพระภิกษุสงฆ์ จังหวัดจันทบุรี: ความชุกและปัจจัยเสี่ยง

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บทคัดย่อ

โรคเบาหวานและอาการแสดงที่สัมพันธ์กับกลุ่มโรคเบาหวาน คือปัญหาสุขภาพที่สำคัญของคนไทย รวมถึงกลุ่มพระภิกษุสงฆ์ การศึกษาวิจัยแบบภาคตัดขวางนี้ มีวัตถุประสงค์เพื่อประมาณค่าความชุกของโรคเบาหวานและภาวะที่มีความผิดปกติของระดับน้ำตาลในเลือดที่เสี่ยงต่อการเกิดโรคเบาหวานในกลุ่มพระภิกษุสงฆ์ จังหวัดจันทบุรี โดยศึกษาในพระภิกษุสงฆ์ ที่มีอายุ 35 ปีขึ้นไป จำนวน 415 รูป สุ่มเลือกตัวอย่างตามลำดับชั้น เก็บข้อมูลจากแบบสัมภาษณ์ การตรวจร่างกาย และการเจาะโลหิตปลายนิ้วเพื่อตรวจค่าระดับน้ำตาลหลังอดอาหารอย่างน้อย 8 ชั่วโมง

ผลการศึกษา พบว่า ค่าความชุกของโรคเบาหวานของภิกษุสงฆ์ในจังหวัดจันทบุรีเท่ากับร้อยละ 10.8 โดยพบพระภิกษุสงฆ์ร้อยละ 2.8 ปัจจุบัน ยังรักษาอาการป่วยด้วยโรคเบาหวาน และร้อยละ 8 ของกลุ่มพระภิกษุสงฆ์ พบว่าเป็นการตรวจครั้งแรกและพบความผิดปกติของระดับน้ำตาลในเลือด ส่วนค่าความชุกของภาวะที่มีความผิดปกติของระดับน้ำตาลในเลือดหลังอดอาหารผิดปกติ(IFG) ได้เท่ากับ ร้อยละ 11.8 เมื่อนำมาวิเคราะห์ด้วยการถดถอยพหุคูณ พบว่ามี 5 ปัจจัย ที่มีความสัมพันธ์กับโรคเบาหวานอย่างมีนัยสำคัญทางสถิติ ได้แก่ จำนวนพรรษาที่บวช ค่าความดันโลหิตตัวบนที่เริ่มสูง การเดินบิณฑบาต การดื่มน้ำชาเขียวหรือชาบรรจุขวด 0-3 วัน/สัปดาห์ และการขาดความรู้เรื่องโรคเบาหวาน การคัดกรองโรคเบาหวานต้องทำสม่ำเสมอและต่อเนื่อง เพื่อเป็นการค้นหาผู้ป่วยรายใหม่ซึ่งสามารถจะทำรักษาได้ทันท่วงทีในช่วงแรก การส่งเสริมการเคลื่อนไหวร่างกายที่คล้ายการออกกำลังกายในกลุ่มพระภิกษุสงฆ์ ตลอดจน การส่งเสริมความรู้ให้กับประชาชน ถึงอาหารที่เหมาะสมในการถวายพระ เช่น อาหารไขมันต่ำ อาหารที่มีกากใยอาหารสูง การเพิ่มผักและผลไม้ที่ไม่หวานมากในการบริโภค เพื่อเป็นการส่งเสริมให้พระภิกษุสงฆ์ได้รับอาหารที่ดีมีประโยชน์ต่อสุขภาพ ซึ่งจะทำให้ร่างกายแข็งแรงสามารถประกอบกิจของสงฆ์ได้อย่างเหมาะสมและถือว่าเป็นการทำนุบำรุงอุปถัมภ์พระพุทธศาสนาให้ยั่งยืนสืบไป.

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CHAPTER I
INTRODUCTION

1.1 Rationale and background

Diabetes (DM) is a global health and economic problem included Thailand. DM is also the most common cause of blindness among working-age adults, the most common cause of non-traumatic amputations and end-stage renal disease, and a common cause of death (1). Approximately 97% of cases were type 2 diabetes. In 2004, the prevalence of DM (FPG ≥126 mg/dL) weighted to national population (NHES) was 6.7% (6.0% in men and 7.4% in women), and impaired fasting glucose (IFG) was 12.5% (14.7% in men and 10.4% in women), (2). IFG is a type of abnormalities condition for pre-diabetes (FPG 110-125 mg/dL) (3). Some evidences have documented that IFG are associated with increased risk of cardiovascular events (4), have a greater risk of developing type 2 diabetes compared with those normal FPG levels. For the effectiveness of diabetes prevention and control, it is also important to routine assess the prevalence of IFG. Care for DM patients required varied resources and involves a substantial economic burden. Early detection and appropriate DM care reduces mortality and prevents or delays the onset of diabetes complications (5).

In Thailand, approximately 95% of the populations are Buddhists. There are 25,000 Buddhist temples, 251,997 monks scattered throughout the country(6). All men are supposed to be in ordaining for some periods in their lives. The monks are devoted to spiritual development and kept strict discipline. They depend on the lay people for necessities in life such as food, clothing, lodging and medicine, and give them spiritual advice and guidance in return.

Buddhist monks has different manner from the general population. According to the Buddhist discipline, monks can have normal diet in the morning, before 12 am and can have only fruit juice or water for the rest of the day (7). A recent study revealed that about 35.0% of Buddhist monks and Novinces in Central

Bangkok have some health problems and health risk (8). Monks are one of the high risk groups of DM since they consume food and beverages offered by lay people only. In addition, their daily routine is pretty much the same and lacking exercises. The sedentary lifestyle elevates the risk of obesity and diabetes (9). In 2007, report from Priest Hospital, Bangkok revealed that of 17,381 Buddhist monks treated at the hospital, 17.8% had diagnosed DM, 17.1% had diagnosed hypertension and, 13.5% had diagnosed hyperlipidemia (10).

Chanthaburi is a province located in the east of Thailand, about 245 km. from Bangkok. In 2007, there were 341 temples and 151 monasteries. The number of monks aged ≥35 years who were a high risk group of DM was supposed to be 1,436. At present, little information is available in the literature regarding the prevalence of DM and IFG. To improve the Buddhist monks' health and early detection for DM, it was deemed important to conduct a health survey for this group.

1.2 Objectives

1. To estimate the prevalence of diabetes mellitus and impaired fasting plasma glucose among the Buddhist monks in Chanthaburi Province;

2. To describe the general characteristics, i.e., age, education, ordination duration, dhamma education, temple location, weight, height, BMI, waist circumference, systolic, diastolic blood pressure etc. among the Buddhist monks in Chanthaburi Province;

3. To describe the daily life activities of alms-gathering among the Buddhist monks in Chanthaburi Province;

4 To assess the food and beverages consumption among the Buddhist monks in Chanthaburi Province;

5 To measure the knowledge of diabetes among the Buddhist monks in Chanthaburi Province;

6. To determine the associations between the Buddhist monk's general characteristics, daily life activity, food and beverages consumption, knowledge of diabetes and prevalence of diabetes among the Buddhist monks in Chanthaburi Province.

1.3 Hypotheses

1 There are associations between Buddhist monk's general characteristics, i.e., age, ordination duration, dhamma education, temple location, height, weight, BMI, waist circumference, systolic and diastolic BP etc. and the prevalence of DM among Buddhist monks in Chanthaburi Province;

2. There is an association between Buddhist monk's daily life activities, i.e., chanting, walking meditation, alms-gathering etc and the prevalence of DM among Buddhist monks in Chanthaburi Province;

4. There is an association between Buddhist monk's food and beverages consumption and the prevalence of DM among Buddhist monks in Chanthaburi Province;

5. There is an association between Buddhist monk's knowledge of diabetes and the prevalence of DM among Buddhist monks in Chanthaburi Province.

1.4 Study variables

1.4.1 Independent variables

- General characteristics of Buddhists monks included age, number of years being ordained, secular educational, dhamma education, weight, height, BMI, waist circumference and temple location etc.

- Daily life activity of Buddhist monks included morning and evening chanting, dhamma study/ meditation, invitations to outside the temple activities, walking meditation, maintenance of temple and its surroundings, physical exercise at least 30 minutes and alms-gathering

- Food and beverages consumption

- Knowledge of diabetes.

1.4.2 Dependent variables

- Prevalence of diabetes (DM) and impaired fasting glucose (IFG)

1.5 Definition of variables

Diabetes mellitus (DM) refers to level of fasting plasma glucose (FPG) ≥126 mg/dL or had been diagnosed as diabetes (3)

Impaired fasting glucose (IFG) or pre-diabetes refers to a condition in which blood glucose levels are higher than normal but not yet diabetes (FPG 110-125 mg/dL) (3).

Monks refer to men who have been ordained and become Buddhist monks.

Ordination duration refers to the number of years to be ordained as Buddhist monks.

Dhamma education refers to the highest level of Buddhist studies that the monks received after ordination.

Alms-gathering refers to the means by which Buddhist monks get their food. Buddhist monks only present themselves at the door of a potential donor, stand quietly for a few moments and after receiving something, move on.

Body mass index (BMI) refers to a measure of body weight based on a person's weight and height. It was calculated as weight in kilograms divided by the square of the height in meters. A BMI of <18.5 is defined as under weight, BMI 18.5 - 22.9 as normal weight, BMI 23 - 29.9 as over weight, BMI ≥30 as obesity (11).

Waist circumference (WC) was measured at 1 cm above the umbilicus. A waist circumference of ≥90 cm in men was defined as central obesity (12).

Blood pressure (BP) was measured by the researcher. The mean of two measurements was used in the analysis.

Hypertension refers to the blood pressure level either being treated for hypertension, or mean diastolic BP≥90 or systolic BP≥140 mmHg (13).

1.6 Conceptual framework

Figure 1.1 shows the factors that assume to affect the prevalence of DM and IFG among Buddhist monks in Chanthaburi Province.

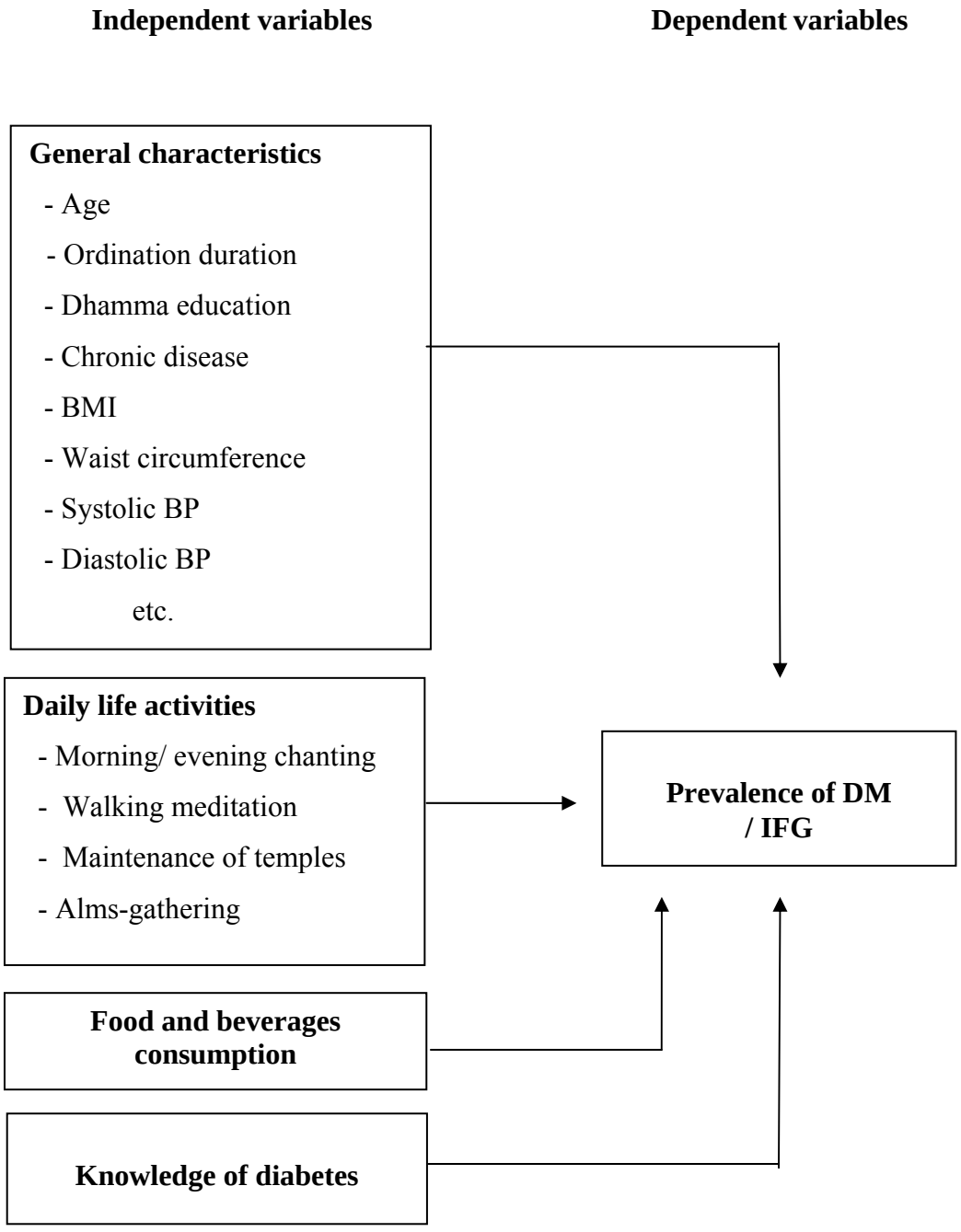

Figure 1.1 Conceptual framework of the study

CHAPTER II
LITERATURE REVIEW

This chapter presents literature review covered the following topics:

2.1 Diabetes mellitus

2.2 The Buddhist monks

2.3 Related research findings

2.1 Diabetes mellitus

Diabetes mellitus is a group of metabolic diseases characterized by high blood plasma glucose levels, which result from defects in insulin secretion, or action, or both Diabetes mellitus, commonly referred to as diabetes was first identified as a disease associated with sweet urine, and excessive muscle loss in the ancient world (3). Elevated levels of blood glucose lead to spillage of glucose into the urine, consequently the term sweet urine. Normally, blood plasma glucose levels are tightly controlled by insulin, a hormone produced by the pancreas. Insulin lowers the blood glucose level (14). When the blood glucose elevates (for example, after eating food), insulin is released from the pancreas to normalize the glucose level. In patients with diabetes, the absence or insufficient production of insulin causes hyperglycemia. Diabetes is a chronic medical condition, meaning that although it can be controlled, it lasts a lifetime (15).

American Diabetes Association, 2004 classified diabetes into 4 types as the following (14) :

1. Type 1 DM: insulin dependent diabetes mellitus: IDDM refer to the diabetes which is born from beta rays cell destruction of the pancreas, the majority is will born , autoimmune, the minority will don't know the cause, the diabetes this kind finally have to use the insulin, for protect condition occurrence ketoacidosis

2. Type 2 DM: non insulin dependent diabetes mellitus: NIDDM refer to the diabetes which is born from the condition, at the insulin cooperates the abnormality in pouring insulin of the pancreas, which , be the diabetes which can meet often most (15).

3. The diabetes other kind: the diabetes which is born from hereditary abnormality at knows distinct kind, the disease of the pancreas, the abnormality of the hormone, medicine, or chemicals and other.

4. Gestational diabetes mellitus: GDM refer to the diabetes is or the abnormality of the durability builds the glucose that has to diagnose for the first time while, pregnancy (16).

Over time, diabetes can lead to blindness, kidney failure, and nerve damage. These types of damage are the result of damage to small vessels, referred to as micro vascular disease. Diabetes is also an important factor in accelerating the hardening and narrowing of the arteries (atherosclerosis), leading to stroke, coronary heart disease, and other large blood vessel diseases. This is referred to as macro vascular disease (17).

2.1.1 Causes of diabetes

Insufficient production of insulin (either absolutely or relative to the body needs), production of defective insulin (which is uncommon), or the inability of cells to use insulin properly and efficiently leads to hyperglycemia and diabetes (1). This latter condition affects mostly the cells of muscle and fat tissues, and fat tissues, and results in a condition known as insulin resistance (16). This is the primary problem in type 2 diabetes. The absolute lack of insulin, usually secondary to a destructive process affecting the insulin producing beta cells in the pancreas, is the main disorder in type 1 diabetes. In type 2 diabetes, there also is a steady decline of beta cells that adds to the process of elevated blood sugars (17). For mare, please read the Insulin Resistance article. Essentially, if someone is resistant to insulin, the body can, to some degree, increase production of insulin and overcome the level of resistance. After time, if production decreases and insulin cannot be released as vigorously, hyperglycemia develops (18).

Glucose is a simple sugar found in food. Glucose is an essential nutrient that provides energy for the proper functioning of the body cells. Carbohydrates are broken down in the small intestine and the glucose in digested food is then absorbed by the intestinal cells into the bloodstream, and is carried by the bloodstream to all the cells in the body where it is utilized. However, glucose cannot enter the cells alone and needs insulin to aid in its transport into the cells. Without insulin, the cells become starved of glucose energy despite the presence of abundant glucose in the bloodstream. In certain types of diabetes, the cells inability to utilize glucose gives rise to the ironic situation of starvation in the midst of plenty. The abundant, unutilized glucose is wastefully excreted in the urine (19).

Insulin is a hormone that is produced by specialized cells (beta cells) of the pancreas. (The pancreas is a deep – seated organ in the abdomen located behind the stomach) In addition to helping glucose enter the cells insulin is also important in tightly regulating the level of glucose in the blood. After a meal the blood glucose level rises. In response to the increased glucose level the pancreas normally releases more insulin into the bloodstream to help glucose enter the cells and lower blood glucose levels after a meal. When the blood glucose levels are lowered, the insulin release from the pancreas is tuned down. It is important to note that even in the fasting state there is a low steady release of insulin than fluctuates a bit and helps to maintain a steady blood sugar level during fasting. In normal individuals, such a regulatory system helps to keep blood glucose levels in a tightly controlled range. As outlined above, in patients with diabetes, the insulin is either absent, relatively insufficient for the body s needs, or not used properly by the body. A; pf these factors cause elevated levels of flood glucose (hyperglycemia) (17).

Types of diabetes: There are two major types of diabetes, called type 1 and type 2. Type 1 diabetes mellitus comprises approximately 10 percent of diabetes incidence. Type 2 diabetes mellitus comprises approximately 90 percent of diabetes.

Type 1 diabetes was also called insulin dependent diabetes mellitus (IDDM) or juvenile onset diabetes mellitus. In type 1 diabetes, the pancreas undergoes an autoimmune attack by the body it self, and is rendered incapable of making insulin. Antibodies are proteins in the blood that are part of the body s immune system. The patient with type 1 diabetes must rely on insulin medication for survival (20).

In autoimmune diseases, such as type 1 diabetes, the immune system mistakenly manufactures antibodies and inflammatory cells that are directed against and cause damage to patients own body tissues. In persons with type 1 diabetes, the beta cells of the pancreas , which are responsible for insulin production , are attacked by the misdirected immune system. It is believed that the tendency to develop abnormal antibodies in type 1diabetes is, in part, genetically inherited, though the details are not fully understood. Exposure to certain viral infections (mumps and Coxsackie viruses) or other environmental toxins may serve to trigger abnormal antibody responses that cause damage to the pancreas cells where insulin is made. These antibodies can be measures in the majority of patients, and may help determine which individuals are at risk for developing type 1diabetes.

Type 2 diabetes was also referred to as non – insulin dependent diabetes mellitus (NIDDM), or adult onset diabetes mellitus (AODM). In type 2 diabetes, patients can still produce insulin, resistance as discussed above. In many cases this actually means the face of insulin resistance as discussed above. In many cases this actually means the pancreas produces larger than normal quantities of insulin. A major feature of type 2 diabetes is a lack of sensitivity to insulin by the cells of the body (particularly fat and muscle cells). In addition to the problems with an increase in insulin resistance, the release of insulin by the pancreas may also be defective and suboptimal. In fact, there is a known steady decline in beta cell production of insulin in type 2 diabetes that contributes to worsening glucose control. (This is a major factor for many patients with type 2 diabetes who ultimately require insulin therapy). Finally, the liver in these patients continues to produce glucose through a process called gluconeogenesis despite elevated glucose levels. The control of gluconeogenesis becomes compromised (21).

While it is said that type 2 diabetes occurs mostly in individuals over 30 years old and the incidence increases with age, we are seeing an alarming number patients with type 2 diabetes who are barely in their teen years. In fact, for the first time in the history of humans, type 2diabetes is now more common than type 1 diabetes in childhood. Most of these cases are a direct result of poor eating habits, higher body weight, and lack of exercise (22, 23).

While there are a strong genetic component to developing this form of diabetes, there risk factors – the most significant of which is obesity. There is a direct relationship between the degree of obesity and the risk of developing type 2diabetes, and this holds true in children as well as adults. It is estimated that the chance to develop diabetes doubles for every 20% increase over desirable body weight (24). Regarding age, data shows that for each decade after 40 years of age regardless of weight there is an incidence of diabetes. Diabetes con occur during pregnancy. Significant hormonal changes during pregnancy con lead to blood sugar elevation in genetically predisposed individuals. Blood sugar elevation during pregnancy is called gestational diabetes. Usually resolves once the baby is born. However, 25 – 50 % of women with gestational diabetes will eventually develop Type 2 diabetes later in life, especially in those who require insulin during pregnancy and those who remain overweight after their delivery. Patients with gestational diabetes are usually asked to undergo an oral glucose tolerance test about 6 weeks after giving birth to determine if their diabetes has persisted beyond the pregnancy, or if any evidence (such as impaired glucose tolerance) is present that may be a clue to the patient s future risk for developing diabetes (18)

2.1.2 Diabetes symptoms

The early symptoms of untreated diabetes are related to elevated blood sugar levels, and loss of glucose in the urine. High amounts of glucose in the urine con cause increased urine output and lead to dehydration. Dehydration causes increased thirst and water consumption. The inability of insulin to perform normally has effects on protein, fat and carbohydrate metabolism. Insulin is an anabolic hormone, that is, one that encourages storage of fat and protein. A relative or absolute insulin deficiency eventually leads to weight loss despite an increase in appetite. Some untreated diabetes patients also complain of fatigue, nausea and vomiting. Patients with diabetes are prone to developing infections of the bladder, skin, and vaginal areas. Fluctuations in blood glucose levels con lead to blurred vision. Extremely elevated glucose levels con lead to lethargy and coma (19)

2.1.3 Diabetes diagnosed.

The fasting blood glucose (sugar) test is the preferred way to diagnose diabetes. It is easy to perform and convenient. After the person has fasted overnight (at least 8 hours), a single sample of blood is drawn and sent to the laboratory for analysis. This can also be done accurately in a doctor s office using a glucose meter (3). Normal fasting plasma glucose levels are less than 110 milligrams per deciliter (mg/dL) (14). Fasting plasma glucose levels of more than 126 mg/dL on two or more tests on different days indicate diabetes. A random blood glucose test con also be used to diagnose diabetes a blood glucose level of 200 mg/dL or higher indicates diabetes (20).

When fasting blood glucose stays above 110 mg/dL, but in the range of 100- 126 mg/dL, this is known as impaired fasting glucose (IFG). While patients with IFG do not have the diagnosis of diabetes, this condition carries with it its own risks and concerns, and is addressed elsewhere.

Acute complications of diabetes

Severely elevated blood sugar levels sue to an actual lack of insulin or a relative deficiency of insulin.

Abnormally low blood sugar levels due to too much insulin or other glucose – lowering medications.

2.1.4 Chronic complications of diabetes

These diabetes complications are related to blood vessel diseases and are generally classified into small vessel disease, such as those involving the eyes, kidneys and nerves (micro vascular disease), and large vessel disease involving the heart and blood vessels (macro vascular disease). Diabetes accelerates hardening of the arteries (atherosclerosis) of the larger blood vessels, leading to coronary heart disease (atherosclerosis) of the larger blood vessels leading to coronary heart disease (angina or heart attack), strokes, and pain in the lower extremities because of lack of blood supply (claudication) (18).

Findings from the Diabetes Control and Complications Trial (DCCT) and the United Kingdom Prospective Diabetes Study (UKPDS) have clearly shown that aggressive and intensive control of elevated levels of blood sugar in patients with type

1 and type 2 diabetes decreases the complications of large blood vessel diseases. Aggressive control with intensive therapy means achieving fasting glucose levels between 70 – 120 mg/dL: glucose levels of less than160 mg /dL after meals: and a near normal HBA1C levels (see below).

2.1.5 Diagnostic criteria

For diabetes mellitus: Classic Symptom: Plus Casual Plasma Glucose Concentration >200 mg/dL or Fasting Plasma Glucose >126 mg/dL or 2 – hour Plasma Glucose >200 mg/dL Oral Glucose Tolerance Test Normal fasting Plasma Glucose < 110 mg/dL, Impaired fasting Plasma Glucose >110 mg / dl and <126 mg/dL Provisional diagnosis of diabetes mellitus >126 mg/dL (3, 4, 16, 18, 25).

2.1.6 Diabetes screening service guidelines

The Bureau of Epidemiology, Department of Disease Control Ministry of Public Health (2004) has developed the following qualities for monitoring diabetes by screening for Type 2 diabetes as follows:

1. Every age group in the population must receive diabetes screening services at least once annually in cases where there are clinical signs such as one or more of the following symptom: frequent and excessive urination; unexplained weight loss with good appetite; frequent and excessive thirst, itchy skin or reproductive organs. Unexplained foot / hand numbness (25, 26).

2. The population that has no clinical signs of having diabetes .People under 40 years of age must have diabetes screening services at least once a year in cases where risk factors are present e.g. obesity (BMI > 25 kg/m^2) direct relationships to diabetes, hypertension (> 140 mmHg) HDL < 35 mg/dL or triglyceride > 200 mg/dL history of diabetes during pregnancy or history of giving birth to a baby over 4 kg in weight, detection of impaired glucose tolerance or impaired fasting glucose and arterial disease.All people over 40 years of age must receive diabetes screening services at least once a year (26).

3. Diagnosis of diabetes upon examination of blood – glucose levels found fasting plasma glucose to be more than or equal to 126 mg/dL at least

twice, and the diagnosis is confirmed by a doctor. The aforementioned details are shown as Figure.2.1

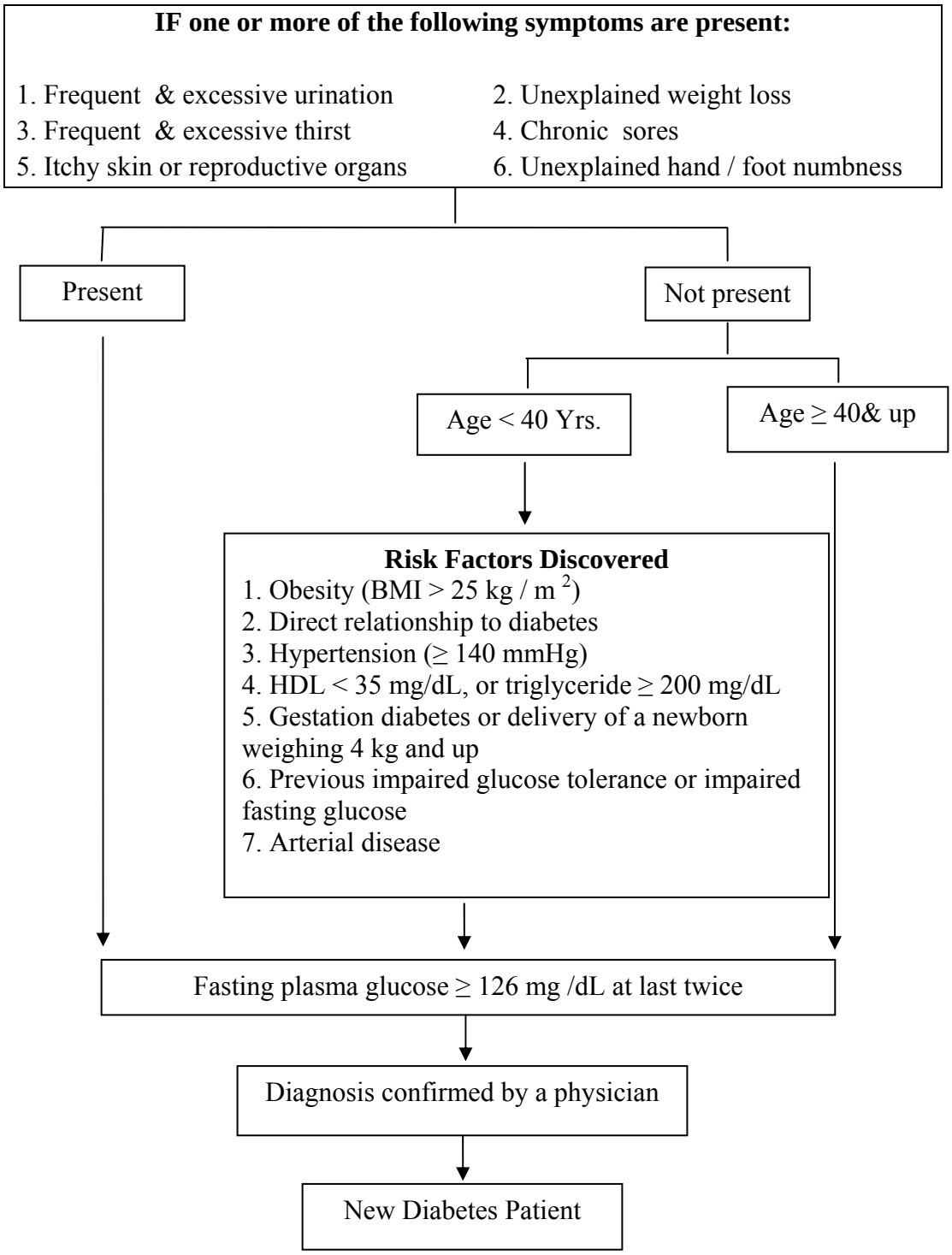

Figure 2.1 Diabetes Screening Guideline (20)

2.1.7 Risk Factors (3, 14, 26, 27, 28, 29, 30)

1. Gestational diabetes: Gestational diabetes affects 0.6 percent to 15 percent of pregnant women.

2. Post transplantation diabetes: Post transplantation diabetes (PTDM) is as the name implies the development of diabetes after transplantation.

3. Association of obesity with diabetes: Weight gain, excess BMI, waist – hip ration and waist circumference are major risk factors for diabetes with the waist circumference displaying the greatest relative risk (33).

4. Diet and diabetes: Several studies have shown that fat intake is associated with impaired glucose metabolism: Glucose levels, insulin resistance, and hyperinsulinemia have been found to correlate with fat intake, particularly saturated fatty acids (34).

5. Diabetes and micro albuminuria: In patients with diabetes , the presence of micro albuminuria confers a tenfold higher risk of developing diabeit nephrpathy annully, compared to patients without micro albuminuria.

6. Effect of alcohol and cigarettes: alcohol is associated with decreased risk of coronary vascular disease in men with diabetes comparable to those without diabetes. Smoking is associated with the etiology of diabetes. In one study, the relative risk of type 2 diabetes in women smoking >25 cigarettes per year versus women who never smoked was 1.42 (95% CI, 1.18 -1.72) (32).

7. Diabetes and physical limitations: People with diabetes have a higher prevalence of risk factor, such as obesity and sedentary behavior, and higher prevalence of health condition, such as vision loss, depression, and cardiovascular disease, that are associated with physical limitations (33, 35).

2.2 The Buddhist monks

The Buddhist monks or “Bhiku” or “Pra Sangkha” was referred to a petitioner requesting to live on begging again the meaning referred to who continue and spread Buddhism for peace of mankind (36).they is those who understand that life full of sufferings. Buddhist monk mean a disciple is or a priest who is a man in the Buddhism be 1 in 4 of the Buddhist which originally call man priest in the Buddhism

that , priest in the Pali monk in the Sanskrit. Buddhist monk be regarded as person have important role in inheriting religion because be doctrine teacher in the Buddhism endure , the Buddhist monk then must behave to arrive at and the property of good Buddhist monk follow regulation Buddha.

2.2.1 Classification of monk (37, 38, 39, 40)

The Buddhist monks could be classified by many criteria, as follows:

By Sect, and it was classified by 2 sects, i.e.

1. The Buddhists Mahayana having the concepts that monk was part of society to respond the needs of societies and had to save people form suffering. Had monks been unable to respond to the need of communities, villages would see usefulness of having monks in communities. Teaching principles and practices were then applied such as training fighting to save villagers from misery even with criminals such as in Shen Chan the history in China, while in Thailand, the Chinese sect (Wat Chin) and Annam sect (Wat Vietnam/Yuan) but the principles of conducts had been applied to be relevant to The Thai societies, which was similar to the sect of Hinayana.

2. Buddhists Hinayana (Deravada) having been viewed of an ideal Par Sangkha,being supreme ,holy, disciplinary, spiritual observance , preserving virtuous precepts by Buddhist enactment for detachment (lokudda dhamma), responsible to teach morals to others, such as Buddhism in Thailand. Pra Sangkha had therefore to save oneself from detachment. Later , in the time of King Rama IV of Rattanakosin era had classified into 2 sects, i.e. Mahanikaya (previous sect), and Dhammayutanikaya (a new stemmed sect).

Classified by dwelling, which were 2 schools as follows:

1. School of Khamawasi (Urban Pra), which emphasized principles of morality and instructed and collaborate with people.

2. School of Aranyawasi (Forst Pra), which emphasized practicing oneself on morality, at the moment, many monks integrated both practices and stayed in the temple but some period, they observed austerity practice on foot pilgrimage.

Classified by moral practices and consequences which were 2 schools as follows:

1. Somuti Sangkha was referred to Bhiku not achieving high level of morality (common monks) associated together for more than 4 monks.

2. Ariya Sangkha was referred to Bhiku achieving high level of morality, who have become enlightened with the teachings of the Lord Buddha and been able to get rid of their impurities, desires, and delusions. Noble monks can further be divided into Sotapana (a stream-enterer), Sakadagami (a once –returner), Anagami (a never-returner), and Arahanta (the perfected one).

2.2.2 Ways of life.

As the Buddhists monk are ordained, their way of life are different from those of laymen. They have different duties, which, according to the teachings of the Lord Buddha, are as follows (39):

They have pure actions-both bodily and spiritually. They have honest ways of life, and they are cautions when they use their sensory perceptions-seeing, hearing, smelling, testing, touch, and feeling. They eat moderately, and they always have perseverance and conscience in what they are doing. They should live in a peaceful dwelling, and they try to purity their mind until they can completely desert all the worldly needs.

In addition, the Lord Buddha once said that monks dwelling should not be in a remote area. They should not be inconvenient to travel or noisy, and they should be free from harms and dangerous animal. They should also be places where the four basic necessities in life can easily be found. Most importantly, there should be older monks who can teach Dhamma to younger monks and novices who may lack knowledge or understanding about the Lord Buddha's teachings (40).

As regards consumption of the four basic necessities in life, monks should use these basic necessities only when they are necessary and when they can directly serve their purposes of use. For instance, they cover themselves with a civara, or a yellow robe, only to protect themselves from heat or cold or harmful insects. Food only to relieve their hunger and to enable themselves to continue their life and to

practice Dhamma. Resident for protect themselves from coldness and dangerous animal, while they take medicines only to get rid of their sickness.

2.2.3 Duties of the Buddhist monks

Duties as specified in the Doctrine and Discipline refer to The Buddhists monk directly being composed and restrained in accordance with the Lord Buddha's teachings, as well as complying with the rules and regulations issued by the monastic order as follows (39, 42):

1. They should be pure and clean, should be indifferent to all the sensory perceptions, both physical and spiritual, and live their live their depending on the four basic necessities only.

2. They should completely fulfill their such as going for alms gathering, morning and evening chanting, cleaning their robes and dwelling, keeping the temple ground tidy, and studying the Dhamma,etc.

3. They should study the Threefold Learning: morality, concentration, and wisdom.

4. They should administer the monk's monastic order according to their title and position. in general , monks who have been ordained for many rainy seasons tend to be appointed chief monks, abbots, vice abbots, the Ecclesiastical Commune-Chief, the Ecclesiastical District Officer, the Ecclesiastic Provincial Governor, the secretary to the Ecclesiastic, etc. Each administrative position has its own duties such as assisting monks and novices, coordinating with government agencies, and facilitating laymen.

5. They have to help spread Buddhism. This can be done both inside and outside the temple. As regards the latter, they can preach on observance days, Sunday, or Buddhist holidays. As regards the latter they can give sermons to laymen in the communities when they are invited to do so. In fact, traveling with a respectable and restrained manner is one way to create faith in the religion among those who come across them.

6. They have to maintain the well being of their dwelling and restore the rest the temple and other structures on the ground of temple. They should also helf raise funds to build dwellings and religious structures in the temple.

7. They have to preserve Buddhism by being ordained for the rest of their lives or at least for many rainy seasons before leaving monkhood. They should also help others who want to enter monkhood by organizing the ordination ceremony, etc

2.2.4 Duties to society

Monks also have duties to society. This is because their existence depends on the society. If the society do not support to society are the following (39, 40, 41):

1. They have to teach the people to have moral and ethics, to avoid all forms of bad deeds, to do only good deeds, to be pious, and to apply religious teaching in their everyday life. In addition to giving sermons on Buddhist holidays, they con publish books or periodicals to spread the teachings of the Lord Buddha, or they can form a group of Dhamma – messengers who go to teach people living in remote areas so as to enable people to live a happy and peaceful life.

2. They should organize training sessions so as to enable people to achieve peace of mind and wisdom as there are a lot of struggles and competitions in the present – day society.

3. They should support schools, both inside and outside the compound of the temple. This can be done by helping teach Buddhism to school students, donating scholarships and learning materials to schools, and raising funds from well – to –do kinsmen to build new schools, etc.

4. hey should lead people to perform religious ceremonies on Buddhist holy days including the Vesak (the full – moon day of the sixth lunar month to commemorate the Lord Buddha s Birth, Enlightenment, and Passing), Asaha (the full – moon day of the eighth lunar month to commemorate the First sermon and t6he Fonudation of the Buddhist Order), and the Rains-Entry Day . Monks should also facilitate people who want to organize traditional festivals such as Thai New Year Day , Loi Kratong Day , etc.

5. Monks should preserve and maintain a good condition of valuable arts and crafts, as well as objects and structures of historical significance such as mural paintings, vihara, uposatha hall (consecrated assembly hall), and pagodas. They should teach people to understand the importance of these objects and structures as well.

6. Monks need to teach community members to develop their community and to protect the environment such as building roads in the village, planting tress on the temple ground, and teaching them to keep their homes clean and not to litter, etc.

7. Monks should teach people to preserve the forests and wildlife.

The Buddhists monk duties according to the Doctrine – Discipline and their duties to society reflect monk's significance as the representative of the religion. If monks do not strictly fulfill their duties, people will lose faith in them and in the religion. Buddhism, as a result, may lose its significance, and it may disappear from society. Monks are to perform duties to benefit the society at large, making the religion institution the central point of society. In other words, monks are both spiritual and social leaders of the people the community and they are truly representatives whose paramount responsibility is to maintain and spread Buddhism.

2.2.5 Daily life activities of monks

In general, both monks and novices have to strictly obey the Doctrine – Discipline. Their daily life activities con be summarized as follows (40, 41, 42, 43):

1. They need to pay homage the Buddha images both after waking up and before going to bed. They con light the incense sticks and candle if they wish.

2. They have to perform both morning and evening chanting with other monks. Chanting with other monks in the temple is one way to strengthen their unity and harmony. Also, chanting also reminds them to concentrate on the Triple Gem and to maintain their self – restraint.

3. They have to listen to the Patimokkha, or the Fundamental Precepts. Even though they are in the Makata language which some monks may not understand, they need to follow the tradition to show respect to the Lord Buddha s teachings.

4. They should listen to sermons on Dhamma hearing days (on observance days which fall on the 8,14, or 15 days of the old lunar calendar). Monks should pay close attention to the Dhamma so that they can apply the teachings in their lives.

5. They should learn and become knowledgeable in the Doctrine – Discipline.

Regulations, orders, and announcements of the monastic order and the Sangha Supreme Council directly and indirectly related to monks health promoting behaviors (44, 45).

The temple must control and support planting of trees in the temple and the monastery estate to create shadiness and peacefulness and to support the government's policy in preserving trees and jungles (Rules and order of the Sangha Supreme Council item 5,B, E , 2520)

Monks and novice monks are prohibited from using, taking , and injecting drugs whose ingredients and effects resemble those of alcohols and addictive drugs except for medical purposes as prescribed by doctors (Rules and order of the Sangha Supreme Council , item 8 , B. E 2521) (46)

Monks and novice monks are prohibited from performing the role of medical doctors (Announcement of the Monastic Order, item 10, B.E. 2499)

As for radio and television, monks are prohibited from listening to the radio or watching television too loudly; from listening to music, performances , boxing , or other entertainment which are forbidden according to the Disciplines (Announcement of the Monastic Order, item 13, B. E. 2503)

Monks are prohibited from playing a musical instrument and watching entertainment (musical melodrama, movie, racy folk banter and song show, folk music, couple dance), which are considered an ecclesiastical offence in all cases, cases, according to the monastic regulation, book 2, verse 14, page 6 (44).

Monks are prohibited from playing sports (boxing,chess), which are consideres an ecclesiastical offence in all cases, ecclesiastical offence in all c cases, according to the monastic regulation, book 2, verse 18, page 114.

Monks are prohibited from playing sepak – takraw, football, and weight lifting, according to the monastic regulation, book 2, verse 18, and page 114.

Monks are prohibited from eating raw fish and a dish containing uncooked blood, according to the monastic regulation, book 2, verse 19, and page 128 – 129.

In conclusion , it can be seen that some items in the regulation, order , and announcement of the Monastic Order and the Sangha supreme Council support health promoting behaviors of monks. However, there are some issues which are

contradictory to health promotion in the present day society such as prohibition of sport activities or provision of traditional healings. At present, monks play an important role in giving healthcare to the general public, which is in congruence with the roles of monks in promoting the public s physical and mental (45).

In summary, people tend to think that monks are more intelligent and knowledgeable in different fields of knowledge than ordinary people (46). In the old days monks were leaders in the community, and they even acted as teachers, or personal consultants. In addition to this, people understood, that monks were those who preferred a humble life with no worldly desires, or stress. However, at present, monks are more highly educated in secular and religious matters, and temples compete with one another especially when it comes to developing the temples and building new structures (50). Moreover, some monks may have to deal with their own chronic illnesses, and they may have to live their lives in a temple located in the middle of the city which is crowded and noisy. They may have to share a dwelling with many other monks, and they may lack basic necessities in life. Finally, they may have a hard time adjusting themselves to the new lifestyle strictly following 227 rules of the Doctrine – discipline. These reasons can easily affect the monk's readiness to adjust themselves, and they can lead to stress. Worse yet how monks con deal with stress may be limited with the Doctrine – Discipline, and this may increase the degree of seriousness of the problems the are facing. Monks coping strategies, therefore, are related to their individual factors, as well as related social factors, that is, social support, which enable them to effectively cope with stress and maintain health.

2.2.6 Education

Chronologically the education had been observed in many system, i.e.

1. Monkhood system and it was classified into

The morals program (primary, intermediate and advanced levels) and extended to secular such as students in the morals programs (certificate of primary moral studies, intermediate moral studies, and advanced moral studies, found in the Sunday Buddhist schools)

The Pali program classified into 9 levels (1 st and 2 nd were associated); morals levels of 1-9comparable to the secular studies as follow (39):

The Pali program 3 was equivalent to junior secondary.

The Pali program 6 was equivalent to junior secondary. (or the pali program 5 with 300 experiences was equivalent to senior secondary)

The Pali program 9 was equivalent to bachelor degree.

The general education contained and senior secondary systems.

1. Higher education in the Monkhood University was Mahachulalongkorn Rajvidyalai, and Mahamakut Rajvidyalai.

2. Training had been organized with programs and specific ones were moral practices centers in temples or institutions e.g, Jitabhawan Vidyali, etc.

2.2.7 The Buddhists monk relating to food consumption

Food and nutrition are basic factors needed for existence of human life. They can maintain our body strength and health whenever receiving adequate and necessarily – nutritional value without contaminated food. On the contrary, in case of insubstantial or insufficient food portion, it will cause malnutrition and illness (47).

Soitor and Crowley defined food consuming habit as ways to consume food and food consumption behavior which could be changed according to environment, society and culture, as well as mental and physical condition (46).

From the above concepts, it could be summarized that food consumption behavior is defined as selection to consume food, consuming or not consuming certain kind of food, hygienic habit which could be changed according to environment, society and culture, as well as mental and physical condition.

The “National Health Recommendation “which developed in 1994 for healthy Thai ten guidelines concerning food consumption are (45):

Eat variety of foods from each of five major food groups and maintain desirable weight. Each type of food is composed of many nutrients such as protein, carbohydrate, fat, minerals, vitamins, water as well as dietary fiber, which help the body function properly. Therefore, eat a variety of foods from each of these 5 food

groups and in appropriate amounts in order to obtain all the nutrients that the body needs might help to achieve good nutrition status.

Form Nutrition Flag and National Health Recommendation, it can be summarized for young adults and working men with suggested energy intake at 2,000 Kcal which includes 10 grain- group serving, 5 vegetable – group serving 4 fruit – group servings – meat – group serving and 1 dairy – group serving. They should avoid high fat food, should avoid high fat foot, uncooked meat, food with a lot of sugar and salty and spicy. And they should also avoid tea (33), coffee, tonic drinks and carbonated beverage. They should also aware of hygienic habits (48, 49).

The Buddhists monk lifestyle differs from that of general people because after being ordained as monks, they must conduct themselves according to religious disciplines as the Lord Buddha has set Sangha as "Vinaya' (Department of religious Affairs, which includes the 4 Parajika; the 13 Sanghadisesa; the 2 Aniyata; the 30 Nissaggiya; the 92 Pacittiya; the 4 Patidesaniya; the 75 Sekhiyavatta and the 7 Adhikarana. These add up to 227 precepts mentioning both directly and indirectly ways of consumption behavior. (40, 41, 50)

If a Bhiku eats food at the wrong time-that is, from mid-day until daybreak of the following day, it is a pacittiya (Fourth Group: Bhojanagga item 7).

If a Bhiku eats food which was given into his hand (or into the hands of any other bhiku) on a previous day, it is a pacittiya (Fourth Group: Bhojanagga item 8) (51).

If a Bhiku drinks intoxicating liquors, it is a pacittiya (Sixth Group: Surapanavagga item 1).

I (means "a Bhiku") will eat curries in the right proportion to the rice (Second Group: Bhojanagga item 8) (52).

It is described in Phradhrampidhok(2003:13) that it is necessary to consider before eating the food . That means the monks have to consider eating in moderate way to response the need of their body not to response to the taste of the food and eating adequate, which is called Bhojanapatisamyutta (moderation in eating) (53).

It is stated in the Buddhist fundamental rules and the monastic orders that the novices are not allowed to take medicine which is contaminated with stimulants like alcohol and narcotics, and they are also not allowed to inject the addictive drug into their body.(Vimala:28), and not allowed to eat uncooked meat (54).

It could be summarized that monks must be careful to have adequate food consumption for the need of their body as recommended by "Nutrition Flag". They should avoid high fat food, uncooked meat, and food a lot of sugar, salty and spicy food. And they should also tea coffee, tonic drinks and carbonated beverage. They should aware of hygienic habits.

2.3 Related research findings

Tasonthi (48) studied Thai Buddhist monks' consumerist behavior. The results demonstrated that all three groups of Buddhist monks had types of possession and collection. They collected and owned similar materials such as computer sets, television, VDO, mobile telephones, CD players, radios and cassette tape recorders and players, and electric fans. The usage type of consumption of the Buddhist monks identified the learning behaviors in two different patterns. Those patterns were learning as those of the non – Buddhist monks, and learning for self – development and Buddhism development simultaneously.

Phasnpitys (49) studied the role of Buddhists monk on health promotion for elderly in Trat province. The results showed that expected and action roles on health promotion for elderly of Buddhist monks found of being at a high level (mean = 4.16, SD = 0.66) and (mean =3.85, SD = 0.63). Significant factors relating to expected roles on health promotion for elderly were knowledge on health promotion for elderly and types of temples. Significant factors relating to action roles were on health promotion for elderly were age, seniority and position of monks. The problems and obstacles were that the operational method was not clear. There was a lack of support from relating units; monks had restrictions in doing the job due to the fear of breaking regulations. Monks, therefore, suggested that they should be trained in health promotion and relating units, both private and governmental should render support continuously.

Charoenkit (50) studied the desirable characteristics of Buddhist temples by comparing the desirable characteristics and activities of the Buddhist temples with actual situations of the temple in present day of Thai society in 1997. According to the findings, desirable temples were those that were quiet, peaceful, and garden – like. The space in the temple should be carefully arranged for maximum utilization. When comparing the actual situation of temples in modern Thai society and desirable characteristics and activities of the Buddhist temples, it was discovered that both similarities and differences were found. As for similarities, the temples located in a rural area were quiet and peaceful and suitable for practicing meditation and study Dharma and those situated in Bangkok and other urban areas were convenient when it come to communication and had sufficient buildings to accommodate activities . On the other hand, the rural temples lacked buildings for activities, while those in Bangkok and other city areas were not quiet and peaceful but too crowded to practice meditation and others.

Wongjirasawad (51) carried out a study to investigate mental health of monks in Bangkok in 2002. The subjects were 900 monks, and the Symptom Checklist (SCL-90) was used. She found that 33.9 % of the monks had a mental health condition which could be considered a health problem. Among these, 50.5% had behavioral symptoms and thinking which indicated mental sickness, 44.9% had unreasonable fear, and 36.7 % felt that they had some form of physical symptoms.

There were statistically significantly differences among monks at different ages when it came to mental symptoms including fear of communication with others, depression, anxiety, unfriendliness, and behavioral symptoms and thinking signifying am mental illness.

There were statistically significantly differences among monks with different marital status before ordination when it came to feeling of physical symptoms.

There were statistically significantly differences among monks with different income when it came to obsessive – compulsive behaviors.

There were statistically significantly differences between monks with a physical symptoms and those who did not when it come to obsessive – compulsive behaviors and anxiety.

There were statistically significantly differences among monks with different number of years being ordained, when it come to behavioral symptoms and thinking signifying a mental sickness.

There were statistically significantly differences among monks with different areas of Dharma studies when it come to fear of communication with others, depression and behavioral symptoms and thinking signifying a mental sickness ($p=0.05$). Monks who studied Dharma had higher mean scores than those who studied Pali with statistical significance at the 0.05 level.

In a survey study by Pusanasuwansri and Tienvichit (52) compared healthcare behaviors of 213 monks who furthered their studies at Mahmongkut Royal College and Jittapawan College in March of 1998 based on their age and level of studies. The monk subjects were asked to complete a self – administered questionnaire developed by the researchers to elicit information on four aspects of healthcare behavior regarding food intake, Also, healthcare behavior regarding drinking tea and coffee needed to be improved.

The healthcare behaviors of monks categorized based on age and level of studies was similar, that is, overall it was at a fair level. When considering each aspect of healthcare behavior, only exercise was at a good level: the others were at a fair level. Also, healthcare behavior regarding drinking tea and coffee needed to be improved.

A comparison of healthcare behavior of monks revealed that overall monks' behavior was not statistically significantly different at the 0.05 levels when considering their age and level of studies. However, when considering each aspect of healthcare behavior, it was fond that there was a statistically significantly different when it come to personal hygiene care ($p< 0.05$). Thai is, monks who aged 40 years and over have better behavior than those who were younger than 40 years. With regards to food intake, monks who graduated from high school or higher had a better behavior than those who completed elementary education or lower.

Based on these finding, the following recommendations were made by the researchers:

As for food intake, monks should be advised to reduce or avoid foods and drinks that can be harmful to health such as salty food, tea and coffee, carbonated drinks, energy drinks, and uncooked food.

As regards exercise, monks should work out regularly to maintain their strength. In actuality, daily activities of monks including asking for food in the alms bowl and developing the temple are not enough to exert energy and the excess energy they have left may be detrimental to health.

With regard to smoking, related agencies should set up a campaign to convince monks to quit smoking as a large number of monks smoke. The most important target group is the abbots of each temple as they are leaders and should be a role model for other monks. They can also play an important role in a no – smoking campaign.

Concerning personal hygiene care, monks should be advised to take good care of their personal hygiene regularly including washing their hands before meals, washing their robes, and cleaning their bedding. In addition, they should be taught not to share a razor with other monks and not to drink their own urine which can be harmful to their health. Moreover, monks should be advised to have an annual physical examination and a dental check – up, especially those who are younger than 40 year old those who completed only elementary education or lower. In additions specific needs into consideration.

Suksavage (53) examined stress coping among 417 Buddhist monks in Bangkok metropolitan. It was found that more than half of the subjects, or 54.3 % had stress higher than a normal level, and 8.7 % had a high level of stress which needed treatment. In addition, these monks received a high level of support from their fellow monks and their families and a moderate level of support from superiors in the temple. It was also found that monks used more problem – focused coping than emotion – focused coping to deal with stress. In addition multiple regression analysis indicated that there was a positive relationship between support from superiors, support from fellow monks, support from families, and donated financial incomes, and problem – focused coping ($p< 0.05$). On the other hand, stress level and age were negatively associated with problem – focused coping with a statistical significance of ($P <0.05$). These factors could also co – predict problem – focused coping by 17.4 %, with social

support from superiors at the best predictor level. With regard to emotion - focused coping, stress level and social support from families were positively associated with emotion – focused coping with statistical significance (P< 0.001) and could co – predict emotion – focused coping by 20.8 % with stress level as the best predictor.

Polvan (36) in examined the factorc associated with quality of life among Buddhist monks with chronic disease in Saraburi province, Thailand. The mean age of subjects was 60.6 years (SD=13.3). Most of them suffered from hypertension (59.4%) and 76.2% had overall mean quality of life ≥ 50.

Janpet (54) examined the factors associating with health promoting behavior of the monks seeking care at Priest Hospital. Previous study indicated that social education levels and the perception of them self potency and Buddhism regulations were significantly associated with health promoting behaviors in the monks. Interestingly, duration of ordination, Buddhism education level, Nikayana and location of the temple, including history of medical conditions had no statistical associated with health promoting behaviors.

2.3.2 Diabetes mellitus

Vichit (55) conducted a case-control to examine the predisposing factors of diabetes mellitus of population aged 40 years and over in Suphan Buri Province.

The results showed that the following factors were significantly related to diabetes mellitus:

Doing exercise: those not doing housework regularly were 6.1 times more likely to develop diabetes mellitus (OR=6.1, 95%CI=2.0-18.1) than those doing it regularly. The persons not doing exercises regularly were 2.4 times more likely to develop diabetes (OR=2.4, 95%CI=1.6-3.6) than those doing exercises regularly. In addition, the persons with the blood pressure over 140/90 mmHg were 4.6 times more likely to develop diabetes mellitus (OR=4.6, 95%CI = 3.0-7.0) than those having the blood pressure less than 140/90 mmHg.

Obesity: Persons who cannot control their weight and waist were 5.9 times more likely to develop diabetes mellitus (OR=5.9, 95%CI = 3.6-9.7) than those controlled their weight and waist. In addition, person whose overall body mass index

over 25 were 3.3 times more risky to develop diabetes mellitus (OR=3.3, 95%CI = 2.1-5.1) than those having the body mass index equal or less than 25.

Food consumption: persons with appropriate consumption behaviors were 0.4 time less likely (OR=0.4, 95%CI = 0.2-0.7) to develop diabetes mellitus than those with inappropriate behaviors. Moreover, any persons who did not eat more vegetable and fruit and less sodium were 4.4 times more likely to develop diabetes mellitus (OR=4.4, 95%CI = 2.6-4.2) than those eating more vegetable and fruit and less sodium.

Knowledge of diabetes mellitus: persons who had unacceptable diabetes knowledge were 1.8 times more likely to develop diabetes mellitus (OR=1.8, 95%CI = 1.0-3.0) than those with acceptable diabetes knowledge.

Tanasansutee (56) examined the health behaviors of adults at risk of developing diabetes in a rural area of Khon Kaen Province. The results showed that the key informants had various lifestyles according to their careers and gender. Adults who were at risk of developing diabetes showed health behaviors which could be divided into 10 groups

1. Eating behaviors
2. Living well (living in a clean and safe house and environment)
3. Exercise behaviors (working until perspiration and exercising methods)
4. Sleep and rest behavior
5. Stress management behaviors (desire restraint, not thinking, not paying attention, relying on religion)
6. Self care behaviors related to sickness (self medicating, attending nurses' or physicians' private clinic and traditional doctors as well)
7. Smoking behaviors
8. Drinking behaviors (dinking to increase appetite and for socialization)
9. Buying lottery (creating hope)

10. Behaviors related to making merits (praying, greeting food offerings to a Buddhists monk).

Regarding factors related to health behaviors, 4 groups were identified

1. Personal factor (perceptions, roles and responsibilities, health, economy, mentality and personal habits)
2. Family factors (relationships of family members)
3. Environmental factor (community characteristics, social networks, culture, values)
4. Gender factors (gender differences, gender roles).

Sandhi Wynn Nyunt (57) examined self – efficacy, self – care behaviors and glycemic control among 266 type 2 diabetes patients attending two private clinics in Yangon, Myanmar. About 62.0% had high self- efficacy levels. Multiple logistic regression revealed four variables associated with glycemic control: age ≥60 years (OR=2.46, 95% CI=1.17-5.21), taking one oral hypoglycemic agent (OHA) (OR=2.56, 95%CI=1.26-5.19), being overweight (OR=2.01, 95%CI=1.02-3.95) and having a high self-efficacy level (OR=5.29, 95%CI = 2.20-12.75).

Siralux (58) examined the personal diabetes preventing factors, the factor that have the relation with checking selects to filter the diabetes, be age that increase (OR=1.11; 95%CI=1.03-1.19), having family history of diabetes (OR=1.43, 95%CI =1.01-2.01), having congenital disease, (OR=1.86, 95%CI =1.28-2.46)ๅ

Dilmanian (59) The data submitted to the New York State Department of Health Coronary Angioplasty Reporting System Database on coronary angioplasties performed at Westchester Medical Center/New York Medical College from 1996 to 2005 were analyzed. Compared with 1996, during 2005, more coronary angioplasties were performed (1,624 vs 1,122), and the patients were older (mean age 64.5 vs 61.0 years, p <0.001), weighed more (84.2 vs 82.0 kg, p <0.001), had a higher mean body mass index (28.8 vs 28.3 kg/m(2), p <0.001), and had a higher prevalence of diabetes mellitus (27% vs 17%, p <0.001). The prevalence of systemic hypertension was significantly higher in 2005 (76%) than in 1996 (54%) (p<0.001). In conclusion, in 2005 compared with 1996, patients who underwent coronary angioplasty at Westchester Medical Center/New York Medical College were older, had higher body

mass indexes, and had higher prevalence of diabetes mellitus and systemic hypertension.

Niswender (60) studied diabetes and obesity: therapeutic targeting and risk reduction - a complex interplay Obesity is a major risk factor for the development of diabetes and predisposes individuals to hypertension and dyslipidaemia. Together these pathologies increase the risk for cardiovascular disease (CVD), the major cause of morbidity and mortality in type 2 diabetes mellitus (T2DM). Worsening trends in obesity and T2DM raise a serious conundrum, namely, how to control blood glucose, blood pressure, and lipids when many anti-diabetic agents cause weight gain and thereby exacerbate other cardiovascular risk factors associated with T2DM. Further, evidence suggests that some established antihypertensive agents may worsen glucose intolerance. Many patients who are obese, hypertensive, and/or hyperlipidaemic fail to achieve blood pressure, lipid and glycaemic goals, and this failure may in part be explained by physician reluctance to utilize complex combination regimens for fear of off-target effects.

Liu et al (61) examined the prevalence of diabetes and impaired fasting glucose in Chinese adults from China National Nutrition and Health Survey, 2002. The results revealed that the prevalence of diabetes and IFG in Chinese adults was 2.7% and 4.9% respectively. The prevalence of diabetes among Chinese who lived in urban areas was 2 to 3 times higher than the prevalence among those who lived in rural areas (3.9% for urban areas and 6.1% for large cities vs 1.9% for rural areas).

Yan et al (62) examined the prevalence of metabolic syndrome and its relation to body composition in a Chinese rural population. The results according to the three definitions, the age-adjusted prevalence of MetS for adults 25 to 64 years old was 3.2%, 4.9% and 3.9%. Body fat percentage and BMI and waist circumference were significantly associated with each component of MetS, especially with triglyceride level, insulin resistance index, and number of MetS components (r=0.28 to 0.49).

Lee et al (63) examined the urban – rural differences in the prevalence and associated factors with type 2 diabetes mellitus (T2DM) in Korean adults, with Anthropometric measures, blood pressure, lipid profiles, and fasting and 2-hr after75-g

oral glucose lode blood glucose were obtained .The crude- and age standardized prevalence of T2DM was 15.4% and 11.7% in urban and rural districts. Multivariate regression analysis revealed that older age, high triglyceride levels, central obesity and hypertension were significantly associated with T2DM in both areas. a family history of T2DM was significantly associated with T2DM in rural area. T2DM is more prevalence in urban than in rural population.

Laurentius et al (64) conducted a cross- sectional study to examine the prevalence and predictors of undiagnosed diabetes mellitus in Indonesia. The prevalence of undiagnosed diabetes mellitus was 4.1%. Age, sex, social economic status, education level, obesity, central obesity, hypertension, physical in activity, and smoking habit were significantly associated with undiagnosed diabetes mellitus ($p<0.05$). Multivariate analysis found predictors of undiagnosed diabetes mellitus were: age, obesity, central obesity, hypertension, and smoking habit.

In a meta-analysis by Vasanti et al (65) revealed that Sugar–sweetened beverages were risk of metabolic syndrome and Type 2 diabetes. Individuals in highest quantile of SSB (Sugar–sweetened beverages) intake (most often 1-2 serving/day) had a 26% greater risk of developing type 2 diabetes mellitus than those in the lowest quantile (non or<1 serving/month) RR=1.26, 95%CI 1.12-1.41. Among studies evaluating metabolic syndrome, including 19,431 participants and 5,803 cases, the pooled RR was 1.12 (RR=1.2, 95%CI 1.02-1.42).

Misra et al (66) conducted a cross-sectional epidemiological descriptive study. There was high prevalence of diabetes, obesity and dyslipidaemia in urban slum hpopulation in northern India. In this study the overall prevalence being 10.3% (95%CI 7.8-13.2), obesity was prevalence 13.3% (95% CI 8.5-19.5).on the other hand, classifying obesity based on percentage body fat (%BF), 10.65 (95%CI 5.4-14.8). Stepwise multiple linear regression analysis showed that for both male and females BMI, WHR and %BF were positive predictors of biochemical parameters, except for HDL-c, for which these parameters were negatively associated.

Balde' et al (67) examined the prevalence and risk factors associated with diabetes and impaired fasting glucose in rural and urban populations in Futa Jallon (Guinea). The overall crude diabetes and IFG prevalence were 6.1% and 13.4%. Urban location, age, waist to hip ratio, excess waist circumference, hypertension,

raised systolic and diastolic blood pressures were significantly associated with DM. In multivariate analysis, only age ($p=0.002$) and waist circumference ($p<0.05$) remained independently associated with DM.

CHAPTER III
MATERIALS AND METHODS

The content of this chapter covers the following topics: research design, study site and samples, research instruments, measurements, data collecting, data analysis, and ethical considerations.

3.1 Study design

This study is a cross-sectional study.

3.2 Study site and samples

This investigation was conducted in 10 districts of Chanthaburi Province, a province in the eastern part of Thailand, 245 kms away from Bangkok. The study populations were all Buddhist monks who lived in Chanthaburi Province during the study period. In 2007, there were 341 temples and 151 monasteries. The number of monks aged ≥35 years who were a high risk group of DM was supposed to be 1,436.

Inclusion criteria

1. Buddhist monks aged 35 years or over;
2. Who has been ordained and resided in a temple in Chanthaburi for at least 1 year.
3. Willing to participate in the study.

Exclusion criteria

1. Buddhist monks with acute renal failure, seizure or using insulin etc.
2. Cannot speak Thai language.

Sampling method

The sample size was calculated using the following formula (52, 53)

$$n = \frac{Z^2_{1-\alpha/2} P(1-P) N}{d^2(N-1) + Z^2_{1-\alpha/2} P(1-P)}$$

When,

n = The estimated sample size.

α = The level of statistical significance was set at 0.05.

$Z_{1-\alpha/2}$ = The value from normal distribution association with confidence interval = 1.96 for 95% CI.

P = The proportion of DM prevalence in Buddhists monk from pilot survey, the value of 0.17 was determined from pilot study (54)

N = Population in this study was 1,436 people.

d = The absolute precision required on other side of the study, the value of 0.03 was selected.

Then, we calculated sample size when $Z_{1-\alpha/2}$ = 1.96, P = 0.17, N = 1,436 and d = 0.03

$$n = \frac{(1.96)^2 \times 0.17 \times (1-0.17) \times 1{,}436}{\left[0.03^2 \times (1{,}436-1)\right] + \left[1.96^2 \times 0.17 \times (1-0.17)\right]}$$

$$= 424.53$$

$$n = 425$$

The required sample size was at least 425 respondents, but this study recruited 450 respondents to detect about 6% non –respondents.

The study samples were drawn according to the following steps:

Step 1: selecting temple/ monastery

- List all monks aged ≥35years who resided in temple/ monastery in 10 districts of Chanthaburi Province.
- Calculate the required samples according to proportional to size of each temple/ monastery of all districts as shown in Table 3.1

Table 3.1 Required samples of Buddhist monks according proportional to size of temple/ monastery

District	Residence		Monk aged ≥35 yr	Required samples (monk)
	Temple	Monastery		
Mueang Chanthaburi	49	2	287	90
Tha Mai	50	26	155	49
Na Yai Am	32	10	151	47
Pong Nam Ron	32	22	142	44
Soi Dao	33	38	134	42
Makham	29	15	128	40
Khlung	36	12	127	40
Laem Sing	22	5	124	40
Khao Khitchakut	26	9	96	30
Kaeng Hang Maeo	32	12	89	28
Total	341	151	1,436	450

Step 2: selecting following inclusion criteria

List all Buddhist monks' name who met the inclusion criteria and randomly select the participant until met the sampled required for each temple/ monastery. If any randomly selected Buddhist monk does not want to participate in the study, select the next name. Continued to do so in each residence until the researcher got the required samples of 450 monks.

3.3 Research instruments

Questionnaire

The questionnaire composes of 5 parts as follows:

1. General characteristics
2. Daily life activity
3. Food and beverage consumption
4. Knowledge of diabetes
5. Physical examination

3.4 Measurements

The content validity of the questionnaire was reviewed by 3 experts and was revised before pre-testing. After it was pre-tested with 30 Buddhist monks in Priest Hospital in Bangkok whose baseline characteristics were similar to the real study participants. Cronbach's Alpha was used to assess the questionnaire reliability.

1. General characteristics included aged, education, ordination duration, dhamma education, temple location, etc.

2. Daily life activity comprised 6 items regarding included 6 items regarding activities that the Bhuddhist monks practice in the past 7 days, i.e., dhamma study/ meditation, invitation to join outside the temple activity, walking meditation, maintenance of the temple and its surroundings, and physical activity. No. of day/ week were scored from 0-7. Cronbach alpha was 0.829. Another 3 items were used for assessing alms-gathering characteristics.

3. Food and beverage consumption consisted of 15 items regarding types of food and 6 items regarding types of drink that the Buddhist monks consume in the past 7 days. No. of day/ week were scored from 0-7.

4. Knowledge of diabetes included 15 dichotomous items to measure the Buddhist monks' knowledge of causation, prevention, and management of diabetes. Dichotomous measurement was by "Yes", or "No". A score of '1' was assigned for correct answer and a score of '0' for incorrect answer. A total score of 0-12 was classified as 'Unacceptable' knowledge and 13-15 as 'Acceptable' knowledge. The Cronbach's alpha was 0.731.

5. Blood testing A fasting capillary whole blood was done using using Accu-Check® Advantage: Electro Chemistry for DM management . In the field in accordance with ADA criteria (55). The Buddhist monks were classified according to FPG value: Normal fasting plasma glucose (FPG <110 mg/dL); impaired fasting glucose (IFG) or pre-diabetes (FPG 110-125 mg/dL); diabetes (FPG ≥126 mg/dL).

6. Blood pressure (BP) was assessed by using Termumo digital BP monitor ES-P370 two times. The mean of diastolic BP≥85 or systolic BP≥130 mmHg was classified as raised BP; diastolic BP≥90 or systolic BP≥140 mmHg as high BP(28, 29, 30, 31).

7. Weight and height were measure with subjects wearing light clothing and without shoes by trained research assistants and investigator(16, 17).

8. Body mass index (BMI) refers to a measure of body weight based on a person's weight and height. It was calculated as weight in kilograms divided by the square of the height in meters. A BMI of <18.5 is defined as under weight, BMI 18.5 - 22.9 as normal weight, BMI 23 - 29.9 as over weight, BMI ≥30 as obesity(19,20).

9. Waist circumference (WC) was measured at 1 cm above the umbilicus. A waist circumference of ≥90 cm in men was defined as central obesity (2).

3.5 Data collection

The data collection was preceded in the following sequence:

An introduction letter from the School of Graduate Studies, Mahidol University, was sent to the Chief Superintendent of the Central Ecclesiastic, Buddhism office Chanthaburi province for asking the permission and collaboration in data collection.

The researcher trained the research assistants by informing them about research objectives, sample, techniques and steps in data collection, interpretation of data and recording of data to ensure accuracy, consistency and uniformity.

The researcher or research assistants went to each temple and introduced themselves to the abbot or the assigned monks to explain the research objectives and to ask for permission to collect data from the subjects.

Before collect data, research assistants informed about study information such as research objectives, method and benefit to the study subject and asked them to sign informed consent if he willing to participate this study.

The researcher or research assistants, distributed the questionnaires to the subjects, and gave them a chance for asking questions if they did not understand anything about the questionnaires. They will take around 20 minutes to complete the questionnaire and 15 minutes for physical examination.

3.6 Data analysis

After data collection was completed, data were then checked for completion. All questionnaires were scored and coded, and then data were analyzed by using SPSS for Windows version 17. Significance level was set at $P \leq 0.05$.

1. Descriptive statistics

Percentage, mean and standard deviation, were used to describe demographic characteristics of the subjects and all other study variables.

2. Analytical statistics

Chi-square was used to obtain crude odds ratio. Multiple logistic regression was used to obtain adjusted odds ratio and 95% confidence interval (CI) to determine the association between study factors and the prevalence of DM.

3.7 Ethical considerations

The original research protocol was reviewed and approved by the Ethics Committee of Mahidol University (Appendix A). Permission to conduct this study was obtained from Chief Superintendent of the Central Ecclesiastic, Buddhism office Chanthaburi Province. Written consent for participating in the study was obtained from all participated Buddhist monks. The collected data were used only purposed of this study. No permanent record of study subjects' names and other information were made. All information obtained during interview and physical examination was

confidential. Consent to participate in the study was voluntary. Participant can withdraw from the study at any time and do not to give a reason.

CHAPTER IV
RESULTS

The results are presented in the following topics: general characteristics of the Buddhist monks followed by prevalence of diabetes mellitus (DM) and impaired fasting glucose (IFG), daily life activities, food and beverage consumption, knowledge of diabetes and factors associated with diabetes mellitus**.**

4.1. General characteristics

Of the 415 participated Buddhist monks, 66.5% were Maha Nikaya monks, 71.3% resided in rural area. About 80.2% stayed at Rassdron (public) temple, whereas 14.2% stayed at monastery. The mean age was 54.0 years (range 35-88). About 25.1% had ordination duration 11-20 years with the mean of 15.9 years (range 1-58). Approximately 68.6% stayed in Chantaburi equal or more than 31 years with the mean of 38.7 years (range 1-88). In terms of education, 64.8% finished primary school, 5.8% can read and write and 3.6% finished bachelor degree. Regarding dhamma education, 35.2% finished Nukdham Tri (Grade 1), 3.9% finished Pali scholar level, whereas 21.7% never attended dhamma education.

About 10.8% of Buddhist monks reported chronic illness. The most common reported chronic illness was hypertension (6.7%), whereas 31.8% were missing data. 25.1% took any medicine for his chronic disease. 35.9% took supplementary food. Three of the most frequently used media were television (97.1%), radio (91.8%) and neighbors (65.8%) as shown in Table 4.1.

Table 4.1 General characteristics of 415 Buddhist monks

Variable	Number	%
Type of ordination		
Dhammayut Nikaya	139	33.5
Maha Nikaya	276	66.5
Temple location		
Urban	119	28.7
Rural	296	71.3
Type of temple		
Rassdorn (Public)	333	80.2
Aram Luang (Royal)	23	5.5
Monastery	59	14.2
Age(yr)		
35-44	102	24.6
45-54	126	30.4
≥55	187	45.1
Mean=54.0 Range=35-88		
Ordination duration (yr)		
1-5	93	22.4
6-10	87	21.0
11-20	104	25.1
21-30	65	15.7
31-40	48	11.6
≥41	18	4.3
Mean=15.9 Range=1-58		
Number of years stay in Chanthaburi		
1-5	57	13.7
6-10	29	7.0
11-20	25	6.0
21-30	19	4.6
≥31	285	68.6
Mean=38.7 Range=1-88		

Table 4.1 General characteristics of 415 Buddhist monks (Continued)

Variable	Number	%
Education		
Can read and write	24	5.8
Primary school	269	64.8
Secondary school	72	17.3
High school	21	5.1
Vocational school	12	2.9
Higher vocational school	2	0.5
Bachelor degree	15	3.6
Dhamma education		
Nukdham Tri (Grade 1)	146	35.2
Nukdham To (Grade 2)	48	11.6
Nukdham Aek (Grade 3)	115	27.7
Pali scholar level	16	3.9
Never attend dhamma education	90	21.7
Chronic illness		
No	238	57.3
Hypertension	28	6.7
Diabetes mellitus	12	2.9
Cancer	4	1.0
Pulmonary diseases	3	0.7
Renal diseases	2	0.5
Gout	2	0.5
Peptic ulcer	2	0.5
Liver diseases	1	0.2
Diseases of respiratory system	1	0.2
Missing	132	31.8
Take any medicine for your chronic disease		
No	311	74.9
Yes	104	25.1

Table 4.1 General characteristics of 415 Buddhist monks (Continued)

Variable	Number	%
Take supplementary food		
No	266	64.1
Yes	149	35.9
Sources of receiving health information [a]		
Television	403	97.1
Radio	381	91.8
Neighbors	273	65.8
Village broadcasting tower	272	65.5
Relatives	269	64.8
Buddhist monks	266	64.1
Newspaper	131	31.6
Health personnel	91	21.9
Others	264	63.6

[a] multiple response

4.2 Anthropometric variables, systolic, diastolic and fasting plasma glucose

Table 4.2 shows the anthropometric variables of the 415 participated Buddhist monks. About 77.6% had height 150-169.9 cm. The mean height was 162.6 cm. (range 149-191 cm). Approximately 48.4% had weight 50-69.9 kg. The mean weight was 64.8 kg (range 45-87 kg). About 61.4% were overweight and 13.0% were obese. The mean BMI was 24.6 (range 16.5-36.2 kg/m^2). About 3.9% had waist circumference ≥90 cm (range 51-98). 27.2% had systolic ≥130 mmHg. The mean systolic was 119.8 mmHg (range 90-220). Around 21.7% had diastolic ≥85 mmHg. The mean diastolic was 75.9 mmHg (range 55-120). In relation to fasting plasma glucose level, 11.8% were at impaired fasting glucose, and 10.8% were diabetes mellitus.

4.3 Prevalence of diabetes mellitus and impaired plasma glucose

Of the 415 participated Buddhist monks, 10.8% (45/415) had diabetes mellitus [2.8% (12/415) were treated diabetes and 8.0% (33/415) screened diabetes], 11.8%(49/415) has impaired fasting plasma (IFG). The proportion of diabetes and IFG increased with age in both rural and urban areas. About 15.9%(14/88) of Buddhist monks aged ≥65 years had the highest proportion of diabetes and 15.9%(20/126) of aged 45-54 years had the highest proportion of IFG. The proportion of DM and IFG of Buddhist monks in urban were higher than rural areas (11.8% vs. 10.5% for DM and 15.1% vs. 10.5% for IFG (Table 4.3).

4.4 Daily life activities

Table 4.4 shows the daily life activity of the Buddhist monks. About 51.1% of the monks do morning and evening chanting 1-3 days per week, whereas 16.9% do morning and evening chanting everyday in the previous week. 10.1% studied dhamma/ meditation everyday per week. 51.3% do walking meditation at least 30 minutes at least 4 days per week, 51.8% maintenance the temple and its surroundings and 50.1% do physical exercise at least 30 minutes at least 4 days per week.

Table 4.5 depicts the characteristics of alms-gathering, distance and time spent among Buddhist monks, about 33.5% of the Buddhist monks had no alms-gathering, 40.2% do alms-gathering by walking house by house or at the alms-gathering place. 22.7% use transportation both to and from the alms-gathering place. 40.0% walks 501-1500 meters. The mean of alms-gathering distance was 986 meters, (range 10-4,000). 34.2% spent 31-60 minutes for alms-gathering. The mean of time spending for alms-gathering was 43.2 minutes (range 2-180).

Table 4.2 Anthropometric variables, systolic, diastolic and fasting plasma glucose among 415 Buddhist monks

Variable	Number	%
Height (cm)		
130-149.9	4	1.0
150-169.9	322	77.6
≥170	89	21.4
Mean=162.6 SD=7.5 Range=149-191 cm		
Weight (kg)		
30-49.9	22	5.3
50-69.9	269	64.8
≥70	124	29.4
Mean=64.8 SD=9.6 Range= 45-87 kg		
BMI (kg/m²)		
<18.5 (under weight)	22	5.3
18.6-22.9 (normal weight)	138	33.3
23.0-29.9 (over weight)	201	48.4
≥30 (obese)	54	13.0
Mean=24.6 SD=4.3 Range=16.5- 36.2 kg/m^2		
Waist circumference (cm)		
40-59.9	20	4.8
60-89.9	379	91.3
≥90	16	3.9
Mean=71.9 SD=10.1 Range = 51-98 cm		
Systolic (mmHg)		
80-129	302	72.8
≥130 (raised systolic BP)	113	27.2
Mean=119.8 SD=18.1 Range = 90-220 mmHg		

Table 4.2 Anthropometric variables, systolic, diastolic and fasting plasma glucose among 415 Buddhist monks (Continued)

Variable	Number	%
Diastolic (mmHg)		
40-84	325	78.3
≥85 (raised diastolic BP)	90	21.7
Mean=75.9 SD=11.4 Range = 55-120 mmHg		
FPG (mg/dl)		
60-109 (normal)	321	77.3
110-125 (impaired fasting glucose)	49	11.8
≥126 (diabetes)	45	10.8
Mean=101.6 SD=34.7 Range= 65-459 mg/dl		

Table 4.3 Prevalence of diabetes mellitus (DM) and impaired fasting glucose (IFG) among 415 Buddhist monks by age group and area of residence

Age (Yr)	Rural (%)			Urban (%)			Rural and urban (%)		
	Total	DM	IFG	Total	DM	IFG	Total	DM	IFG
35-44	68	4.4	5.9	34	11.8	5.9	102	6.9	5.9
45-54	96	10.4	13.5	30	10.0	23.3	126	10.3	15.9
55-64	72	11.1	12.5	27	11.1	25.9	99	11.1	16.2
≥ 65	60	16.7	8.3	28	14.3	7.1	88	15.9	8.0
Total	296	10.5	10.5	119	11.8	15.1	415	10.8	11.8

Table 4.4 Daily life activity of 415 Buddhist monks

Activity	Number of days per week (%)			
	0	1-3	4-6	7
Morning and evening chanting	0.0	51.1	32.0	16.9
Dhamma study/ meditation	1.7	49.2	39.0	10.1
Invitation (activity outside the temple)	2.9	52.3	42.9	1.9
Walking meditation at least 30 minutes	3.6	45.1	44.6	6.7
Maintenance of temple and its surroundings	1.9	46.3	41.9	9.9
Physical exercise at least 30 minutes	6.3	43.6	41.2	8.9

4.5 Food and beverage consumption

Table 4.6 shows the frequency of food and beverage items that Buddhist monks consumed in the previous week. The proportions of food items when summed up to be 4-7 days/ week were as follows: rice 49.2%, boil rice/ porridge 19.7%, brown rice 43.6%, sticky rice 50.8%, Noodle 38.1%, rice vermicelli 45.3%, deep fried such as fish, chicken, pork 53.3%, curry with coconut milk such as chicken curry 60.7%, curry without coconut milk such as red curry soup with shrimp 50.6%, stir fried vegetable 51.3%, clear soup 50.6%, chili paste 66.5%, grilled meat such as pork 51.8%, fruits such as orange, pine-apple, rambutan 45.8% and Thai sweet and dessert such as “Foy thong” 44.3%.

In terms of beverages, the proportions of beverage items when summed up to be 4-7 days/ week were as follows: energy drink 24.6%, aerate drink 24.5%, milk 38.5%, coffee 52.3%, Fruit juices or “Pana drink” 29.8% and tea/ bottled tea 27.3%.

4.6 Knowledge of diabetic disease

Table 4.7 depicts the knowledge of diabetic disease of the Buddhist monks. Overall, 74% (307/415) of Buddhist monks had acceptable knowledge. Table 4.7 demonstrates the Buddhist monks’ knowledge of diabetes by item. The correct answer of each item was quite high (at least 85.8%). Three items that had the lowest

correct answer were: people aged 45 years have higher chance to get diabetes (85.5%), Overweight people are more likely to develop diabetes than those normal weights (85.8%) and men are more likely to develop diabetes than women (86.5%).

Table 4.5 Characteristics of alms-gathering, distance and time spent among 415 Buddhist monks

Item	Number	%
Alms-gathering		
No	139	33.5
Walking house by house or at the alms-gathering place and walking back to the temple	167	40.2
Walking house by house or at the alms-gathering place and go back to the temple by van or motorcycle	14	3.4
Taking van or motorcycle to the alms-gathering place and walk back to the temple	1	0.2
Using transportation both to and from the alms-gathering place	94	22.7
Alms-gathering distance (m) n = 276		
100 - 500	8	2.9
501 - 1,500	166	60.1
≥ 1,501	103	37.0
Mean=986.0 SD=949.2 Median =1,000 Range 10-4,000 m		
Alms-gathering time(min) n = 276		
1-30	68	24.6
31-60	142	51.4
61-90	7	2.6
≥ 91	59	21.4
Mean=43.2 SD=43.8 Median = 40 Range 2-180 min		

Table 4.6 Food and beverage consumption behaviors among 415 Buddhist monks

Item	Number of days per week (%)			
	0	1-3	4-6	7
Food				
Rice	5.8	45.1	22.2	27.0
Boil rice/ porridge	21.0	59.3	17.3	2.4
Brown rice	8.2	48.2	41.9	1.7
Sticky rice	8.7	40.5	48.9	1.9
Noodle	10.8	51.1	38.1	0.0
Rice vermicelli	8.7	46.0	44.3	1.0
Deep fried such as fish, chicken, pork	2.7	44.1	51.6	1.7
Curry with coconut milk such as chicken curry	4.6	34.7	58.3	2.4
Curry without coconut milk such as red curry soup with shrimp	0.7	48.7	47.7	2.9
Stir fried vegetable	0.5	48.2	45.8	5.5
Clear soup	0.7	48.7	47.7	2.9
Chili paste	2.7	30.8	60.2	6.3
Grilled meat such as pork	2.7	45.5	49.4	2.4
Fruits such as orange, pine-apple, rambutan	4.6	49.6	40.7	5.1
Thai sweet & dessert such as “Foy thong” etc	7.2	48.4	40.2	4.1
Beverages				
Energy drinks	14.2	61.2	18.8	5.8
Aerated drinks	22.4	53.0	23.1	1.4
Milk	12.0	49.4	27.7	10.8
Coffee	8.2	39.5	29.6	22.7
Fruit juices or “Pana drink”	4.6	65.5	21.4	8.4
Tea/ bottled tea	23.1	49.6	24.6	2.7

Table 4.7 Knowledge of diabetes among 415 Buddhist monks by item

Item	Number	%
Diabetes take long time for treatment	397	95.7
Diabetes need continuous care and treatment	402	96.9
Diabetes symptoms are as follows:		
Urine attracts ants	387	93.3
Frequent urination at night time	371	89.4
Frequent thirsty	362	87.2
Excess weight loss	382	92.0
People aged 45 yr have higher chance to get diabetes	356	85.8
Stress is a risk factor for diabetes	379	91.3
Overweight people are more likely to develop diabetes than those normal weights.	356	85.8
Men are more likely to develop diabetes than women	359	86.5
High blood pressure is a risk factor for diabetes	392	94.5
People who have next of kin with diabetes are more likely to develop diabetes.	384	92.5
Alms-gathering, walking meditation and cleaning the temple consume high energy which reduces the risk of getting diabetes	392	94.5
Diabetes take long time for treatment	397	95.7
Diabetes need continuous care and treatment	402	96.9
Often taking sweet & dessert such as cake, chocolate can cause diabetes.	372	89.6
Diabetes patient should not take sweet fruits such as water-melon, mango and pine-apple.	362	87.2

4.7 Factors associated with diabetes

4.7.1. Univariate analysis

In univariate analysis, all each individual study variables was analyzed by simple logistic regression at a time. Chronic disease was not included in the univariate analysis due to a lot of missing data. Nine variables were statistically associated with diabetes as follows:

Six variables were under general characteristics of Buddhist monks. They were: being age ≥55 years (OR = 2.19; 95%CI 1.16-4.13); duration of ordination >20 years (OR=2.07; 95%CI 1.11-3.87); having waist circumference ≥90 cm (OR= 4.08; 95%CI 1.35-12.34); having raised systolic blood pressure (OR=3.25; 95%CI 1.73-6.11); having raised diastolic blood pressure (OR=3.25; 95%CI 1.73-6.11); having unacceptable knowledge of diabetes (OR=2.56; 95%CI 1.36-4.84) as shown in Table 4.8.

Two variables were under daily life activities. They were: walking alms-gathering (OR=3.65; 95%CI 1.51-8.84); time spent for alms-gathering ≤30 minutes (OR=2.17; 1.06-4.43) as shown in Table 4.9.

Only one variable was under beverage consumption was statistically associated with diabetes. That is drinking tea / bottled tea 0-3 days per week (OR=4.28; 95%CI 1.50-12.24) as shown in Table 4.11.

No variable under food consumption was statistically association with diabetes as shown in Tables 4.10.

4.7.2 Multivariate analysis

Before conducting multivariate analysis, all variables with $p<0.05$ in univariate analysis were tested for multi-collinearity. Two pairs of study variables were found collinearity, age and ordination duration, and alms-gathering and time spent for alms-gathering. In multivariate analysis, only 7 variables with $p<0.05$ in univariate analysis and biological plausibility with diabetes, that is ordination duration, family history of diabetes, waist circumference, raised systolic BP, raised diastolic BP, alms-gathering, drinking tea, knowledge of diabetes were simultaneously entered to the final multiple logistic regression model. Table 4.12 shows 5 variables were significantly associated with diabetes. They were: ordination duration (adjusted OR =

2.60; 95%CI 1.29-5.25); having raised systolic blood pressure (adjusted OR=3.53; 95%CI 1.49-8.35); alms-gathering (adjusted OR=2.68; 95%CI 1.03-6.96); drinking tea/ bottled tea 0-3 day/ week (adjusted OR = 4.56; 95%CI 1.49-13.96); having unacceptable knowledge of diabetes (adjusted OR = 2.37; 95%CI 1.19-4.71) as shown in Table 4.12.

Table 4.8 .Association between general characteristics and diabetes among 415 Buddhist monks

Variable	Total	Diabetes (%)		OR	95% CI	p-value
		Yes	No			
Type of ordination						0.72
Dhammayut Nikaya	139	10.1	89.9	1.00	0.45-1.72	
Maha Nikaya	276	11.2	88.8	0.88		
Type of residence						0.091
Monastery	65	4.6	95.4	1.00		
Temple	350	12.0	88.0	2.82	0.85-9.38	
Type of temple						0.305
Rassdorn (Public)/ Monastery	392	10.5	89.5	1.00		
Aram Luang (Royal)	23	17.4	82.6	1.80	0.59 -5.56	
Area						0.464
Rural	296	10.1	89.9	1.00		
Urban	119	12.6	87.4	1.28	0.66-2.47	
Age(yrs)						0.016
35-54	228	7.5	72.5	1.00		
≥55	187	15.0	85.0	2.19	1.16-4.13	
Ordination duration (yr)						0.023
1-20	284	8.5	91.5	1.00		
>20	131	16.0	84.0	2.07	1.11-3.87	
Education attainment						0.446
≤Primary	365	10.4	89.6	1.00		
≥Secondary	50	14.0	86.0	1.40	0.59-3.33	
Dhamma education						0.369
No / Pali scholar	106	8.5	91.5	1.00		
Nukdham (Grade 1-3)	309	11.7	88.3	1.42	0.66-3.06	

Table 4.8 .Association between general characteristics and diabetes among 415 Buddhist monks (Continued)

Variable	Total	Diabetes (%)		OR	95% CI	p-value
		Yes	No			
BMI (Kg/m^2)						0.317
<30.0	361	10.2	89.8	1.00		
≥ 30.0 (obesity)	54	14.8	85.2	1.52	0.67-3.47	
Waist circumference (cm)						0.007
<90	399	10.0	90.0	1.00		
≥ 90	16	31.3	68.8	4.08	1.35– 12.34	
Hypertension						0.07
No	367	9.8	90.2	1.00		
Yes(BP ≥ 140and ≥ 90 mmHg)	48	18.8	81.3	2.12	0.95-4.73	
Raised systolic blood pressure						<0.001
No (Systolic<130 mmHg)	302	7.3	92.7	1.00		
Yes (Systolic ≥ 130 mmHg)	113	20.4	79.6	3.25	1.73-6.11	
Raised diastolic blood pressure						0.048
No (Diastolic<85 mmHg)	325	9.2	90.8	1.00		
Yes (Diastolic≥85 mmHg)	90	16.7	83.3	1.97	1.01-3.84	
Family history of diabetes						0.098
No	371	10.0	90.0	1.00		
Yes	44	18.2	81.8	2.01	0.87-4.64	
Knowledge of diabetes (score)						0.004
Acceptable (13-17)	307	8.1	91.9	1.00		
Unacceptable (0-12)	108	18.5	81.5	2.56	1.36-4.84	

[a] day/week

Table 4.9 Association between daily life activities and diabetes among 415 Buddhist monks (Continued)

Variable	Total	Diabetes (%)		OR	95% CI	p-value
		Yes	No			
Morning and evening chanting (d/w)[a]						0.118
0-3	212	8.5	91.5	1.00		
4-7	203	13.3	86.7	1.65	0.88-3.11	
Dhamma study/ meditation (d/w)[a]						0.781
0-3	211	10.4	89.6	1.00		
4-7	204	11.3	88.7	1.09	0.59-2.03	
Invitation (d/w)[a]						0.104
4-7	186	8.1	91.9	1.00		
0-3	229	13.1	86.9	1.72	0.90-3.30	
Walking meditation (d/w)[a]						0.508
4-7	213	9.9	90.1	1.00		
0-3	202	11.9	88.1	1.23	0.66-2.29	
Maintenance of temple (d/w)[a]						0.828
0-3	200	10.5	89.5	1.00		
4-7	215	11.2	88.8	1.07	0.58-2.00	
Physical exercise (d/w)[a]						0.861
4-7	208	10.6	89.4	1.00		
0-3	207	11.1	88.9	1.06	0.58-2.00	
Alms-gathering (d/w)[a]						0.004
No	139	4.3	95.7	1.00		
Yes	276	14.1	85.9	3.65	1.51-8.84	
Alms-gathering distance (m) n=276						0.606
≤1,000	173	13.3	86.7	1.00		
>1,000	103	15.5	84.5	1.20	0.60-2.39	
Time spent for alms-gathering (min) n=276						0.031
>30	208	11.5	88.5	1.00		
≤30	68	22.1	77.9	2.17	1.06-4.43	

[a] day/week

Table 4.10 Association between food consumption and diabetes among 415 Buddhist monks

Variable	Total	Diabetes (%)		OR	95% CI	p-value
		Yes	No			
Rice (d/w)[a]						0.066
0-3	211	8.1	91.9	1.00		
4-7	204	13.7	86.3	1.82	0.961-3.43	
Boil rice/ porridge(d/w)[a]						0.455
4-7	82	8.5	91.5	1.00		
0-3	333	11.4	88.6	1.38	0.59-3.21	
Brown rice (d/w)[a]						0.842
4-7	181	10.5	89.5	1.00		
0-3	234	11.1	88.9	1.07	0.57-1.99	
Sticky rice (d/w)[a]						0.126
4-7	211	8.5	91.5	1.00		
0-3	204	13.2	86.8	1.64	0.87-3.07	
Noodle/ rce vermicelli (d/w)[a]						0.713
4-7	158	10.1	89.9	1.00		
0-3	257	11.3	88.7	1.13	0.59-2.15	
Deep fried food (d/w)[a]						0.350
4-7	221	9.5	90.5	1.00		
0-3	194	12.4	87.6	1.35	0.72-2.50	
Curry with coconut milk (d/w)[a]						0.453
4-7	252	9.9	90.1	1.00		
0-3	163	12.3	87.7	1.27	0.68-2.37	
Curry without coconut milk (d/w)[a]						0.309
0-3	205	9.3	90.7	1.00		
4-7	210	12.4	87.6	1.38	0.74-2.59	
Chili paste (d/w)[a]						0.756
4-7	276	10.5	89.5	1.00		
0-3	139	11.5	88.5	1.11	0.58-2.12	

[a] day/week

Table 4.10 Association between food consumption and diabetes among 415 Buddhists monks (Continued)

Variable	Total	Diabetes (%)		OR	95% CI	p-value
		Yes	No			
Grilled meat (d/w)[a]						0.175
4-7	215	808	91.2	1.00		
0-3	200	13.6	87.0	1.54	0.82-2.88	
Fruits (d/w)[a]						0.090
0-3	225	8.4	91.6	1.00		
4-7	190	13.7	88.7	1.10	0.59-2.06	
Thai sweet & dessert (d/w)[a]						0.762
4-7	184	10.3	89.7	1.00		
0-3	231	11.3	88.7	1.10	0.59-2.06	
Crispy snacks (d/w)[a]						0.699
0-3	269	10.4	89.6	1.00		
4-7	146	11.6	88.4	1.13	0.60-2.15	

[a] day/week

Table 4.11 Association between beverage consumption and diabetes among 415 Buddhist monks

Variable	Total	Diabetes (%)		OR	95% CI	p-value
		Yes	No			
Energy drinks (d/w)[a]						0.982
4-7	102	10.8	89.2	1.00		
0-3	313	10.9	89.1	1.01	0.49-2.07	
Aerated drinks (d/w)[a]						0.142
4-7	102	6.9	93.1	1.00		
0-3	313	12.1	87.9	1.88	0.81-4.34	
Milk (d/w)[a]						0.910
4-7	160	10.6	89.4	1.00		
0-3	255	11.0	89.0	1.04	0.55-1.96	
Coffee (d/w)[a]						0.629
4-7	217	10.1	89.9	1.00		
0-3	198	11.6	88.4	1.17	0.63-2.16	
Fruit juice (d/w)[a]						0.592
0-3	291	10.3	89.7	1.00		
4-7	124	12.1	87.9	1.20	0.62-2.31	
Tea / bottled tea (d/w)[a]						0.007
4-7	113	3.5	96.5	1.00		
0-3	302	13.6	86.4	4.28	1.50-12.24	

[a] day/week

Table 4.12 Crude and adjusted odds ratios (ORs) from multiple logistic regression analysis of factors associated with diabetes among 415 Buddhists monks

Variable	Crude		Adjusted [a]		p-value
	OR	95%CI	OR	95%CI	
Ordination duration (yrs)					0.008
1-20	1.00		1.00		
>20	2.07	1.11-3.87	2.60	1.29-5.25	
Raised systolic blood presser (mmHg)					0.004
No (Systolic<130)	1.00		1.00		
Yes (Systolic ≥ 130)	3.25	1.73-6.11	3.53	1.49-8.35	
Alms – gathering					0.043
No	1.00		1.00		
Yes	3.65	1.51-8.84	2.68	1.03-6.96	
Drinking tea (d/w)					0.008
4-7	1.00		1.00		
0-3	4.28	1.50-12.24	4.56	1.49-13.96	
Knowledge of diabetes (score)					0.014
Acceptable (13-15)	1.00		1.00		
Unacceptable(0-12)	2.56	1.36-4.84	2.37	1.19-4.71	

[a] Adjusted for ordination duration, family history of diabetes, waist circumference, raised systolic BP, raised diastolic BP, alms-gathering, drinking tea, knowledge of diabetes.

CHAPTER V
DISCUSSION

Buddhist monk is one of the high risk groups of DM since they consume food and beverages offered by lay people which might be high fat, high carbohydrate and low fiber. Furthermore, their sedentary lifestyle increased the risk of overweight and obesity. This chapter presents the discussion of research findings with focus on prevalence of DM and IFG and the factors associated with the prevalence of DM. The discussion also compares the results with the previous studies.

5.1 Prevalence of DM and IFG

In this study, the prevalence of DM and IFG was 10.8% and 11.8% among Buddhist monks aged ≥35 years and over. The overall DM prevalence was quite lower than that reported from Priest hospital (10.8% vs 17.8%) The possible explanation was that Buddhist monks who sought care at the Priest Hospital were more likely to have the poorer health or have other chronic diseases such as hypertension and hyperlipidemia. However, the prevalence of DM in this study was higher than that of men in the Thai National Health Examination Survey (NHES) (10.8% vs 6.0%) (2). The possible reasons were: 1) this study included the older age samples (≥35 years), whereas the NHES study included the young age men (≥15 years). In several studies showed that prevalence of DM increased with age (16, 17, 18, 19, 20); 2) the sedentary lifestyle of the Buddhist monks. Since sedentary lifestyle could lead the increasing of IFG prevalence. IFG or 'pre-diabetes' could increase the risk for diabetes and was associated with other cardiovascular risk factors (19) and led to increase the prevalence of DM in the later life. The Australian Diabetes, obesity and lifestyle study showed that annual incidence of diabetes was 0.2% and 2.6% among Australians with normal FPG and IFG. Therefore, preventing IFG and diabetes

and controlling FPG at the target levels among individuals with IFG are important public health goals.

About 8% (33/415) of DM prevalence in this study were screened DM. This indicated that the DM screening needs to be regularly continued to identify DM and IFG cases. This information supports the need for the early diagnosis, treatment to prevent the pre-clinical stage of DM and the need for effective measure to prevent the development of DM in the later life.

This study also revealed that the prevalence of DM increased with age and peaked in the oldest age groups in both rural and urban area which was consistent with the results of previously reported in the NHES study (2) and in other countries (20). There was a trend that IFG prevalence increased with age but there was a prevalence peak in age 55-64-year-age group in the overall prevalence.

The prevalence of DM and IFG was higher in urban area 11.8% and 15.1% than in rural area 10.5% and 10.7%. This might be due to the difference of lifestyle, types of diets and physical activity between Buddhist monks in the rural and urban areas.

5.2 Factors associated with DM

In multivariate analysis, 5 variables were significantly associated with the prevalence of DM. They were: ordination duration (adjusted OR = 2.60; 95%CI 1.29-5.25); having raised systolic blood pressure (adjusted OR=3.53; 95%CI 1.49-8.35); alms-gathering (adjusted OR=2.68; 95%CI 1.03-6.96); drinking tea/ bottled tea 0-3 day/ week (adjusted OR = 4.56; 95%CI 1.49-13.96); having unacceptable knowledge of diabetes (adjusted OR = 2.37; 95%CI 1.19-4.71).

The longer ordination duration was statistically associated with the prevalence of DM. The possible explanation was that the longer ordination duration related to the increased age and years of sedentary lifestyle. In this study, age was removed from the final model of multivariate analysis since age was collinearity with ordination duration. The results confirmed several previous studies that the prevalence of DM was expected to increase with aging of the population (16, 17, 18, 19).

The results identified that raised BP was statistically associated with the prevalence of DM. This support the current standards of medical care in diabetes that goal systolic BPs of <130 mmHg are appropriate for most diabetes patients (27, 28, 29, 30). However, it also based on patient characteristics and response to therapy, higher or lower systolic BP targets may be appropriate (27, 30). Although there is no clear optimal target BP in diabetic patients with hypertension, Action to Control Cardiovascular Risk in Diabetes (31) BP trial showed that more intensive lowering of BP in diabetes results in a significant reduction in stroke risk (30).

Alms-gathering was statistically associated with the prevalence of DM. The Buddhist monks with diabetes were more likely to practice alms-gathering than those were not DM. From sub-group analysis, 11 of 12 treated DM cases practice walking alms-gathering (data not shown). This implied that Buddhist monks with DM tried to exercise by walking alms-gathering. Walking alms gathering is a specific mode of physical activities for body movement. Previous studies reported that walking can result in using energy which can reduce rates of chronic diseases included diabetes (21, 22, 23, 32). Physical activity may decrease insulin resistance and increase glucose disposal (24).

Drinking tea/ bottled green tea was statistically associated with the prevalence of DM. Buddhist monks who drank tea/ bottled green tea ≤3 days a week were more likely to develop DM than those drank 4-7 days a week. The possible explanation was that drinking tea is a Thai custom which adopted from Chinese. Drinking patterns are influenced by both individual, cultural factors and availability of drinks that the lay people offered to the Buddhist monks. Although there is a belief that tea/ green tea is a medicinal beverage that can reduce sugar and cholesterol levels and epidemiological evidence that drinking green tea and black tea may help prevent diabetes (33), the association found in this study may be by chance and that future studies are needed to confirm the effect and appropriate dose intake. Since drinking tea in this study was measured by a single question to estimate the number of days per week that the Buddhist monks drank tea/ bottled green tea without any items to measure the amount and type of tea taken. In addition, the cross-sectional study design limited the causal association.

The finding also found that knowledge of diabetes was statistically associated with the prevalence of DM. Buddhist monks with acceptable diabetes knowledge were less likely to develop DM than those with unacceptable diabetes knowledge. The possible explanation was that Buddhist monks with acceptable diabetes knowledge may have a better lifestyle behavior such as doing better physical activities, eating habits and continuing care of preventing diabetes. Previous studies found that eating high fiber and low fat diets can lower the risks of obesity, high BP, diabetes and heart disease and stroke. Since high fiber foods, such as brown rice, fresh fruits and vegetables, cooked dried beans and peas, play an important role in the digestive process as it helps more foods along the digestive tract, adding bulk to stool to help its pass through the bowl (34, 35).

5.3 Limitations

There were three major limitations in this study as follows:

1. The limited sample size which represented only Buddhist monks in Chanthaburi Province;

2. The use of one single glucose capillary sample to define DM. The screened DM cases need to be confirmed by other standard DM tests;

3. The cross-sectional study design limited to determining the causal relationship between significant predictors and prevalence of diabetes.

CHAPTER VI
CONCLUSION AND RECOMMENDATIONS

This cross-sectional study aimed to estimate the prevalence of diabetes (DM) and impaired fasting glucose (IFG) and factors associated with DM prevalence among the Buddhist monks in Chanthaburi Province. A total of 415 Buddhist monks aged 35 years and over were randomly sampled. Data were collected through self-administered questionnaire. A fasting capillary whole blood specimen was collected for glucose measurement. The questionnaire was pre-tested with 30 Buddhist monks seeking care at Priest Hospital in Bangkok. Cronbach's alpha coefficient for daily life activity was 0.829 and knowledge of diabetes was 0.731.

Of the 415 participated Buddhist monks, 66.5% were Maha Nikaya monks, 71.3% resided in rural area. About 80.2% stayed at Rassdron (public) temple, whereas 14.2% stayed at monastery. The mean age was 54.0 years (range 35-88). About 25.1% had ordination duration 11-20 years with the mean of 15.9 years (range 1-58). Approximately 68.6% stayed in Chantaburi equal or more than 31 years with the mean of 38.7 years (range 1-88). In terms of education, 64.8% finished primary school, 5.8% can read and write and 3.6% finished bachelor degree. Regarding dhamma education, 35.2% finished Nukdham Tri (Grade 1), 3.9% finished Pali scholar level, whereas 21.7% never attended dhamma education. About 10.8% of Buddhist monks reported chronic illness. The most common reported chronic illness was hypertension (6.7%), whereas 31.8% were missing data.

About 77.6% had height 150-169.9 cm. The mean height was 162.6 cm. (range 149-191 cm). Approximately 48.4% had weight 50-69.9 kg. The mean weight was 64.8 kg (range 45-87 kg). About 61.4% were overweight and 13.0% were obese. The mean BMI was 24.6 (range 16.5-36.2 kg/m^2). About 3.9% had waist circumference ≥90 cm (range 51-98). 27.2% had systolic ≥130 mmHg. The mean systolic was 119.8 mmHg (range 90-220). Around 21.7% had diastolic ≥85 mmHg. The mean diastolic was 75.9 mmHg (range 55-120). In relation to fasting plasma

glucose level, 11.8% were at impaired fasting glucose, and 10.8% were diabetes mellitus.

Of the 415 participated Buddhist monks, 10.8% had diabetes mellitus, 2.8% treated diabetes and 8.0% screened diabetes], 11.8% has impaired fasting plasma (IFG). The proportion of diabetes and IFG increased with age in both rural and urban areas. About 15.9% of Buddhist monks aged ≥65 years had the highest proportion of diabetes and 15.9% (20/126) of aged 45-54 years had the highest proportion of IFG. The proportion of DM and IFG of Buddhist monks in urban were higher than rural areas (11.8% vs. 10.5% for DM and 15.1% vs. 10.5% for IFG.

In terms of daily life activity of the Buddhist monks, 51.1% do morning and evening chanting 1-3 days per week, whereas 16.9% do morning and evening chanting everyday in the previous week. 10.1% studied dhamma/ meditation everyday per week. 51.3% do walking meditation at least 30 minutes at least 4 days per week, 51.8% maintenance the temple and its surroundings and 50.1% do physical exercise at least 30 minutes at least 4 days per week.

Approximately 33.5% of the Buddhist monks had no alms-gathering, 40.2% do alms-gathering by walking house by house or at the alms-gathering place. 22.7% use transportation both to and from the alms-gathering place. 40.0% walks 501-1500 meters. The mean of alms-gathering distance was 986 meters, (range 10-4,000). 34.2% spent 31-60 minutes for alms-gathering. The mean of time spending for alms-gathering was 43.2 minutes (range 2-180).

The proportions of food items when summed up to be 4-7 days/ week were as follows: rice 49.2%, boil rice/ porridge 19.7%, brown rice 43.6%, sticky rice 50.8%, Noodle 38.1%, rice vermicelli 45.3%, deep fried such as fish, chicken, pork 53.3%, curry with coconut milk such as chicken curry 60.7%, curry without coconut milk such as red curry soup with shrimp 50.6%, stir fried vegetable 51.3%, clear soup 50.6%, chilli paste 66.5%, grilled meat such as pork 51.8%, fruits such as orange, pine-apple, rambutan 45.8% and Thai sweet and dessert such as “Foy thong” 44.3%.

In terms of beverages, the proportions of beverage items when summed up to be 4-7 days/ week were as follows: energy drink 24.6%, aerate drink 24.5%, milk 38.5%, coffee 52.3%, Fruit juices or “Pana drink” 29.8% and tea/ bottled tea 27.3%.

Overall, 74% (307/415) of Buddhist monks had acceptable knowledge. Table 4.7 demonstrates the Buddhist monks' knowledge of diabetes by item. Three items that had the lowest correct answer were: people aged 45 years have higher chance to get diabetes (85.5%), Overweight people are more likely to develop diabetes than those normal weights (85.8%) and men are more likely to develop diabetes than women (86.5%).

In univariate analysis, nine variables were statistically associated with diabetes: being age ≥55 years (OR = 2.19; 95%CI 1.16-4.13); duration of ordination >20 years (OR=2.07; 95%CI 1.11-3.87); having waist circumference ≥90 cm (OR= 4.08; 95%CI 1.35-12.34); having raised systolic blood pressure (OR=3.25; 95%CI 1.73-6.11); having raised diastolic blood pressure (OR=3.25; 95%CI 1.73-6.11); having unacceptable knowledge of diabetes (OR=2.56; 95%CI 1.36-4.84); walking alms-gathering (OR=3.65; 95%CI 1.51-8.84); time spent for alms-gathering ≤30 minutes (OR=2.17; 1.06-4.43); drinking tea / bottled tea 0-3 days per week (OR=4.28; 95%CI 1.50-12.24).

In multivariate analysis, 5 variables were significantly associated with diabetes. They were: ordination duration (adjusted OR = 2.60; 95%CI 1.29-5.25); having raised systolic blood pressure (adjusted OR=3.53; 95%CI 1.49-8.35); alms-gathering (adjusted OR=2.68; 95%CI 1.03-6.96); drinking tea/ bottled tea 0-3 day/ week (adjusted OR = 4.56; 95%CI 1.49-13.96); having unacceptable knowledge of diabetes (adjusted OR = 2.37; 95%CI 1.19-4.71)

6.1 Recommendations

Based on the research findings, the recommendations are as follows:

1. Continued giving and updating DM knowledge to the Buddhist monks. For example, DM and IFG were associated with older age, obesity, hypertension, and hyperlipidemia. DM and IFG greatly increased the risk of vascular related diseases including renal failure, retinopathy, peripheral arterial diseases (PAD). Avoid eating high fat, salty and too sweet diets;

2. Continued health examination survey to detect the pre-clinical stage of DM disease;

3. Treatment after early detection is better than delayed treatment.

4. Accessibility to health services;

5. Continued educate lay people to offer healthy food such as low fat, high-fiber, un-salty food, not too sweet fruits and vegetable to Buddhist monks.

6.2 Recommendations for further study

1. A further study should conducted in other provinces to obtained an overall picture of DM and IFG prevalence at regional or national levels and its associated factors among Buddhist monks.

2. Qualitative research techniques such as in-depth interview and focus group discussion should be used in further study to explore more details of DM risk factors.

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APPENDICES

APPENDIX A
ADVISORY

รายนามผู้ทรงคุณวุฒิ

1. Pha Bhuwanai Nukdham Aek (Grade 3) Sutivari temple Chanthaburi province
2. Mr.Augart aeiuesumart Public Health Technical Officer, Senior Professional Level: Chanthaburi Province Public Health Office .
3. Mr.Vitjit Saynavat Public Health Technical Officer, Professional Level Kaokitchakood Sub-Province Public Health Office.

APPENDIX B

คำอธิบายโครงการวิจัยแก่ผู้เข้าร่วมโครงการ

1. ชื่อโครงการวิจัย โรคเบาหวานและภาวะที่มีความผิดปกติของระดับน้ำตาลในเลือดที่เสี่ยงต่อการเกิดโรคเบาหวานในพระภิกษุสงฆ์จังหวัดจันทบุรี: ความชุกและปัจจัยเสี่ยง

2. ผู้ดำเนินโครงการ นายภูวดล กูรมะสุวรรณ

อาจารย์ที่ปรึกษาโครงการ

รศ.ดร. นพพร โหวธีระกุล	ประธานกรรมการ
รศ.ดร. นวรัตน์ สุวรรณผ่อง	กรรมการ
นพ. เพชร รอดอารีย์	กรรมการ

3. ภูมิหลัง เหตุผลและวัตถุประสงค์การวิจัย

ภูมิหลังและเหตุผล

โรคเบาหวานเป็นโรคเรื้อรังในกลุ่มโรคไม่ติดต่อที่เป็นปัญหาสำคัญในปัจจุบันองค์การอนามัยโลกประมาณว่า มี ผู้ป่วยโรคเบาหวานทั่วโลกในปี พ.ศ. 2550 ประมาณ 246 ล้านคน และคาดว่าอาจจะเพิ่มเป็น 380 ล้านคนในปี พ.ศ. 2568 ในจำนวนนี้ ประมาณ 97 % ป่วยด้วยโรคเบาหวานชนิดที่ไม่พึ่งอินซูลิน

พระภิกษุสงฆ์ คือ กลุ่มประชากรกลุ่มเป้าหมายอีกหนึ่งกลุ่ม ที่ควรได้รับการคัดกรองและตรวจรักษา แต่ในปัจจุบันพบว่าพระภิกษุสงฆ์ได้รับการตรวจร่างกายเพื่อคัดกรองความเสี่ยงน้อยมาก ทั้งนี้อาจเนื่องมาจากวัตรปฏิบัติบางอย่างและปัจจัยด้านประชากร ของพระภิกษุสงฆ์ ที่มีข้อจำกัดทางด้านศีลธรรม ทั้งที่แท้จริง พระภิกษุสงฆ์มีการเจ็บป่วยด้วยโรคเรื้อรัง เช่น โรคความดันโลหิตสูง โรคเบาหวาน โรคหัวใจและหลอดเลือด สูงเหมือนกลุ่มบุคคลปกติทั่วไป ซึ่งจากการศึกษาโครงการพัฒนาของพระภิกษุสงฆ์ ทั่วประเทศ ในส่วนของจังหวัดจันทบุรีเมื่อปี 2549 จำนวน 300 รูป พบว่าพระภิกษุสงฆ์ในจังหวัดจันทบุรี มีระดับน้ำตาลในเลือดสูงถึง ร้อยละ 17 จึงทำให้ผู้วิจัยเกิดความสนใจที่จะศึกษาหาปัจจัยที่อาจมีความสัมพันธ์ที่เกิดขึ้น

วัตถุประสงค์

เพื่อศึกษาเพื่อหาความชุกและปัจจัยเสี่ยงต่อการเกิดโรคเบาหวานในกลุ่มพระภิกษุสงฆ์ในจังหวัดจันทบุรี

4. วิธีการวิจัย

เก็บข้อมูลโดยวิธีการสัมภาษณ์ การตรวจร่างกาย และการเจาะปลายนิ้วเพื่อหาค่าน้ำตาลในเลือดพระภิกษุสงฆ์ ที่มีอายุ 35 ปี ขึ้นที่ จำพรรษาในพื้นที่ วัด /สำนักสงฆ์ /ที่พักสงฆ์ จังหวัดจันทบุรี โดยจะสัมภาษณ์เกี่ยวกับข้อมูลทั่วไป วัตรปฏิบัติ วิถีชีวิต พฤติกรรมการบริโภค พฤติกรรมการฉันน้ำปานะ ความรู้ และการรับรู้เรื่องโรคเบาหวาน การตรวจร่างกายประกอบ ด้วย การชั่งน้ำหนัก วัดส่วนสูง วัดเส้นรอบเอว และวัดความดันโลหิต การเจาะโลหิตบริเวณปลายนิ้วหาค่าน้ำตาลในเลือด

5. เหตุผลที่เชิญชวนให้ผู้ยินยอมตนให้ทำการวิจัยเข้าโครงการวิจัย

เนื่องจากการศึกษาครั้งนี้มีวัตถุประสงค์ที่จะหาความชุกและปัจจัยเสี่ยงที่สัมพันธ์กับการเกิดโรคเบาหวานในพระภิกษุสงฆ์จังหวัดจันทบุรีและท่านเป็นผู้หนึ่งที่คาดว่าจะสามารถให้ข้อมูลที่เป็นประโยชน์แก่การศึกษาครั้งนี้ได้

6. ระยะเวลาที่สัมภาษณ์

ท่านจะถูกสัมภาษณ์ ประมาณ 25 นาที และการการตรวจร่างกายทั่วไป ประมาณ 5 นาที รวม เป็น 30 นาที

7. ประโยชน์ที่คาดว่าจะเกิดขึ้นทั้งต่อผู้ยินยอมตนให้ทำการวิจัยและต่อผู้อื่น

ท่านจะรับประโยชน์โดยตรงจากการศึกษานี้เพราะจะทำให้ทราบถึงสภาวะร่างกายเบื้องต้น เช่น น้ำหนัก ส่วนสูง ความดันโลหิต และระดับน้ำตาลในเลือดและข้อมูลที่ได้จากท่านจะเป็นประโยชน์ในการดำเนินงานด้านส่งเสริมป้องกันโรคเบาหวาน

8. ความเสี่ยงหรือความไม่สบายที่คาดว่าจะเกิดขึ้น

การวิจัยครั้งนี้ไม่มีความเสี่ยงหรืออันตรายใดๆแก่ผู้เข้าร่วมโครงการวิจัย แต่ขณะที่ท่านถูกสัมภาษณ์อาจรู้สึกอึดอัดใจบ้างเล็กน้อย การตรวจร่างกายทั่วไปเป็นการตรวจร่างกายเบื้องต้นทางหลักการแพทย์ และการเจาะปลายนิ้วใช้การเจาะด้วยปากกาเข็มเจาะซึ่งอาจทำให้รู้สึกเจ็บเล็กน้อย

9. มาตรการหรือวิธีการในการป้องกัน หรือลดความเสี่ยงหรือความไม่สบายใดๆ ที่อาจเกิดขึ้นในระหว่างการเข้าร่วมโครงการ

ท่านสามารถหยุดการสัมภาษณ์หรือไม่ตอบคำถามบางข้อที่ท่านรู้สึกอึดอัดหรือไม่ต้องการที่จะตอบ ท่านสามารถพูดคุย อภิปรายประเด็นปัญหาดังกล่าวกับผู้สัมภาษณ์ได้

สำหรับการตรวจร่างกายทั่วไปและการเจาะปลายนิ้ว ใช้เครื่องมือที่ได้มาตรฐานซึ่งได้รับการตรวจสอบจากกรมวิทยาศาสตร์การแพทย์และกระทรวงสาธารณสุขว่าปลอดภัยได้มาตรฐาน

10. การดูแลรักษาความลับของข้อมูลต่างๆ ของผู้ยินยอมตนให้ทำการวิจัย

การวิจัยครั้งนี้ข้อมูลทั้งหมดที่ได้รับจากท่าน จะได้รับการพิทักษ์สิทธิ์ไม่เปิดเผยชื่อในลักษณะของรายบุคคล จะเปิดเผยได้เฉพาะในรูปแบบที่เป็นผลสรุปการวิจัยในภาพรวมเท่านั้น

11. สิทธิผู้ยินยอมตนให้ทำการวิจัยจะถอนตัวออกจากโครงการวิจัย

ท่านมีสิทธิ์จะตอบรับหรือปฏิเสธการเข้าร่วมการวิจัยในครั้งนี้ และถึงแม้ท่านได้ยินยอมเข้าร่วมในการวิจัยแล้ว ท่านยังคงมีสิทธิ์ยกเลิกการเข้าร่วมการวิจัยได้ตลอดเวลา โดยจะไม่มีผลต่อการกิจกรรมหรือผลกระทบใดๆ ต่อตัวท่าน

12. ชื่อ ที่อยู่ และเบอร์โทรศัพท์ที่ผู้ยินยอมตนให้ทำการวิจัยสามารถติดต่อได้โดยสะดวก

หากท่านมีข้อสงสัยเกี่ยวกับการวิจัยครั้งนี้ท่านสามารถสอบถามได้ที่ รศ.ดร.นพพร โหวธีระกุล อาจารย์ที่ปรึกษาโครงการวิจัย ภาควิชาระบาดวิทยา คณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล หมายเลขโทรศัพท์ 086-997-2051 ทั้งในและนอกเวลาราชการ

13. ข้อพิจารณาจริยธรรม

โครงการวิจัยต้องผ่านการอนุมัติจากคณะกรรมการสิทธิมนุษยชนเกี่ยวกับการทดลองในมนุษย์ และหน่วยงานที่เกี่ยวข้องกับการศึกษาก่อนเริ่มเก็บรวบรวมข้อมูล ผู้วิจัยจะชี้แจงแนะนำวัตถุประสงค์ ขั้นตอนและวิธีการวิจัย ตลอดจนข้อเสี่ยงที่อาจจะเกิดขึ้นได้ สอบถามความสมัครใจก่อนเข้าร่วมโครงการ ก่อนลงนามยินยอมเข้าร่วมโครงการ ตลอดจนสิทธิของผู้ยอมตนให้ทำวิจัยในการบอกเลิกการเข้าร่วมโครงการวิจัยโดยเสรี ตลอดการวิจัย การสัมภาษณ์ จะกระทำอย่างระมัดระวัง ข้อมูลของผู้เข้าร่วมโครงการวิจัยจะถูกเก็บเป็นความลับ การนำเสนอข้อมูลจะกระทำในรูปแบบของภาพรวมเท่านั้น

ใบยินยอมให้ทำการวิจัย
โดยได้รับการบอกกล่าวและเต็มใจ (Informed Consent Form)

การวิจัยเรื่อง **โรคเบาหวานและภาวะที่มีความผิดปกติของระดับน้ำตาลในเลือดที่เสี่ยงต่อการเกิดโรคเบาหวานในพระภิกษุสงฆ์จังหวัดจันทบุรี : ความชุกและปัจจัยเสี่ยง**

ผู้รับผิดชอบโครงการ/ สถาบัน

นายภูวดล กูรมะสุวรรณ เลขประจำตัวนักศึกษา 4936432 หลักสูตรวิทยาศาสตรมหาบัณฑิต (สาธารณสุขศาสตร์) สาขาวิชาโรคติดเชื้อและวิทยาการระบาด คณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล กรุงเทพฯ 10400

วันให้คำยินยอม วันที่ .....… เดือน …… พ.ศ. ……

ก่อนที่จะลงนามในใบยินยอมให้ทำการวิจัยนี้ ข้าพเจ้า..... ได้รับการอธิบายจากผู้วิจัยถึงวัตถุประสงค์การวิจัย วิธีการวิจัย รวมทั้งประโยชน์ที่จะเกิดขึ้นจากการวิจัยอย่างละเอียดและมีความเข้าใจดีแล้ว

ผู้วิจัยรับรองว่าจะเก็บข้อมูลเฉพาะที่เกี่ยวกับตัวข้าพเจ้าเป็นความลับ และจะเปิดเผยได้เฉพาะในรูปที่ สรุปผลการวิจัย การเปิดเผยข้อมูลเกี่ยวกับตัวข้าพเจ้าต่อหน่วยงานต่างๆ ที่เกี่ยวข้องกระทำได้เฉพาะกรณีจำเป็นด้วยเหตุผลทางวิชาการเท่านั้น ข้าพเจ้าจะได้รับสำเนาใบยินยอมให้ทำการวิจัยโดยได้รับการบอกกล่าวและเต็มใจเก็บไว้ 1 ฉบับ

ข้าพเจ้ามีสิทธิที่จะบอกเลิกการเข้าร่วมโครงการวิจัยนี้เมื่อใดก็ได้และการบอกเลิกการเข้าร่วมการวิจัยนี้จะไม่มีผลใดๆ ต่อตัวข้าพเจ้าทั้งสิ้น

ลงนาม ……..…… ผู้ยินยอม
(.....)
ลงนาม …… พยาน
(.....)
ลงนาม …… พยาน
(.....)

ในกรณีที่ผู้ยินยอมตนให้ทำการวิจัยไม่สามารถอ่านหนังสือได้ จะต้องได้รับการยินยอมในขณะที่ยังมี สติสัมปชัญญะ และระบุข้อความไว้ตามนี้ ข้าพเจ้าไม่สามารถอ่านหนังสือได้ แต่ผู้วิจัยได้อ่านข้อความในใบยินยอมนี้ ให้แก่ข้าพเจ้าฟังจนเข้าใจดีแล้ว ข้าพเจ้าจึงลงนามหรือประทับลายนิ้วแม่มือขวาของข้าพเจ้า ในใบยินยอมนี้ด้วยความเต็มใจ

ลงนาม ……..…… ผู้ยินยอม

(.....)

ลงนาม …… พยาน

(.....)

ลงนาม …… พยาน

(.....)

QUESTIONNAIRE

ID…….

Questionnaire

Diabetes and impaired fasting glucose among Buddhist monks in Chantaburi Province: Prevalence and associated factors

Instructions: All results will be grouped together for analysis by the research purposes and will be destroyed after the completing of the research project. Please fill-up the questionnaire which is composted of 4 parts as follows:

Part 1 General characteristics

Part 2 Daily life activity

Part 3 Food and beverage consumptions

Part 4 Knowledge of diabetes

Part 5 Physical examination

Temple/Monastery…….

Type of ordination ☐ 1 Dhammayut Nikaya ☐ 2 Maha Nikaya

Sub-district…….……..District…….Chantaburi Province

Area ☐ 1 Urban ☐ 2 Rural

Type of temple

☐ 1 ☐ 2 Level….Type…… ☐ 3

Part 1 General characteristics

1. Name…….

2. Position ☐ 1 Abbot ☐ 2 Other……..

3. Domicile……..

4. Age…….year(s)

5. Years of ordination……..Duration of ordination……Year(s).

6. Number of years stay in Chantaburi…….Year(s).

7. Education attainment before ordination

☐ 1 Primary school ☐ 2 Secondary school ☐ 3 High school

☐ 4 Vocational school ☐ 5 Higher vocational school ☐ 6 Bachelor degree

☐ 7 Higher than bachelor degree ☐ 8 Can read and write

8. Dhamma education

☐ 1 Nukdham Tri (Grade 1) ☐ 2 Nukdham To (Grade 2)

☐ 3 Nukdham Aek (Grade 3) ☐ 4 Pali scholar level……

☐ 5 Never attend dhamma education

9. Do you have any chronic illness? (Multiple responses)

☐ 1 No ☐ 2 Renal diseases

☐ 3 Diseases of eye and adnexa ☐ 4 Liver diseases

☐ 5 Diseases of respiratory system ☐ 6 Pulmonary diseases

☐ 7 Heart diseases ☐ 8 Cardiovascular diseases

☐ 9 Gout ☐ 10 Hypertension

☐ 11 Mental problem/ depressive ☐ 12 Diabetes mellitus

☐ 13 Allergy ☐ 14 Asthma

☐ 15 Partial paralyze/ paralysis ☐ 16 Peptic ulcer

☐ 17 Cancer ☐ 18 Other, specify.....

10. Do you take any medicine for your chronic disease(s)?

☐ 1 No ☐ 2 Yes, specify……

11. Do you take any tonic drug or supplementary food?

☐ 1 No ☐ 2 Yes, specify……

12. Do your next of kin have the following chronic diseases? (Multiple responses)

☐ 1 No ☐ 2 Renal diseases

☐ 3 Diseases of eye and adnexa ☐ 4 Liver diseases

☐ 5 Diseases of respiratory system ☐ 6 Pulmonary diseases

☐ 7 Heart diseases ☐ 8 Cardiovascular diseases

☐ 9 Gout ☐ 10 Hypertension

☐ 11 Mental problem/ depressive ☐ 12 Diabetes mellitus

☐ 13 Allergy ☐ 14 Asthma

☐ 15 Partial paralyse/ paralysis ☐ 16 Peptic ulcer

☐ 17 Cancer ☐ 18 Other, specify…....

13. How many times do you go for medical check-up in the previous 3 years?

☐ 1 Never ☐ 2 Ever……..time(s)

14. Smoking behaviors

☐ 1 Never smoke

☐ 2 Ever smoke Quit smoking for ….yr…..mo

☐ 3 Smoking for…..yr No. of cigarettes/ day…….

15. Alcohol drinking before ordination

☐ 1 Never ☐ 2 Ever

16. Health information media and sources (Multiple responses)

☐ 1 Newspaper ☐ 2 Radio ☐ 3 Television

☐ 4 Public addressing ☐ 5 Health personnel ☐ 6 Villagers

☐ 7 Buddhist monks ☐ 8 Relatives ☐ 9 Other, specify…..

Part 2 Daily life activity

Please tick (✓) in the box the number of days per week that you practice for each activity

2.1. Daily activity

Activity	Number of days per week							
	0	1	2	3	4	5	6	7
Morning and evening chanting								
Dhamma study/ meditation								
Invitation (activity outside the temple)								
Walking meditation at least 30 minutes								
Maintenance of temple and its surroundings								
Physical exercise at least 30 minutes								

2.2. How do you go for alms-gathering?

☐ 1 No alms-gathering because…….

☐ 2 Walking house by house or at the alms-gathering place and walking back to the temple

☐ 3 Walking house by house or at the alms-gathering place and go back to the temple by van or motorcycle

☐ 4 Taking van or motorcycle to the alms-gathering place and walk back to the temple

☐ 5 Using transportation both to and from the alms-gathering place

2.3 Distance and time spent for alms-gathering

Distance……...kilometer(s). Time……...hr(s)

2.4 Time spent for taking rest

Day time…….hrs Night time……hrs

Part 3 Food and beverage consumption

Please rate (✓) the no. days per week that you take the following food and beverages

3.1 Food

Types of food	Number of days per week							
	0	1	2	3	4	5	6	7
Rice								
Boil rice/ porridge								
Brown rice								
Sticky rice								
Noodle								
Rice vermicelli								
Deep fried such as fish, chicken, pork								
Curry with coconut milk such as chicken curry								
Curry without coconut milk such as red curry soup with shrimp								
Stir fried vegetable								
Clear soup								
Chilli paste								
Grilled meat such as pork								
Fruits such as orange, pine-apple, rambutan								
Thai sweet & dessert such as 'Foy thong', boiled mung bean								

3.2 Beverage

Types of beverages	Number of days per week							
	0	1	2	3	4	5	6	7
Energy drinks								
Aerated drinks								
Milk								
Coffee								
Pana drink/ Fruit juices								
Bottled green tea								

Part 3 Knowledge of diabetes

Please tick (✓) the choice as appropriate

No.	Item	Agree	Disagree	Do not know
1	Diabetes take long time for treatment			
2	Diabetes needs continuous care and treatment			
3	Diabetes symptoms are as follows:			
	3.1 Urine attract ants			
	3.2 Frequent urination at night time			
	3.3 Frequent thirsty			
	3.4 Excess weight loss			
4	People aged 45 yr have higher chance to get diabetes.			
5	Stress is a risk factor for diabetes			
6	Overweight people are more likely to develop diabetes than those normal weights.			
7	Men are more likely to develop diabetes than women			
8	High blood pressure is a risk factor for diabetes			
9	People who have next of kin with diabetes are more likely to develop diabetes.			
10	Alms-gathering, walking meditation and cleaning the temple consume high energy which reduces the risk of getting diabetes.			
11	Often taking sweet & dessert such as cake, chocolate can cause diabetes.			
12	Diabetes patient should not take sweet fruits such as water-melon, mango and pine-apple.			

Part 4 Physical examination form (staff only)

Physical examination form Date of examination …./…/…….
Time…….
1. Fasting plasma glucose (FPG)…….mg/dL
2. Height…….meter(s) 3. Weight……..….kg
4. Body mass index (BMI)……..kg/m^2 5. Waist circumference……..…cm
6. Blood pressure Systolic……mmHg Diastolic……..mmHg

เอกสารรับรองจริยธรรมการวิจัยในมนุษย์
โดยคณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์
คณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล

เอกสารรับรองเลขที่	MUPH2008-174
ชื่อโครงการ	โรคเบาหวานและภาวะที่มีความผิดปกติของระดับน้ำตาลในเลือดที่เสี่ยงต่อการเกิดโรคเบาหวานในพระภิกษุสงฆ์ จังหวัดจันทบุรี : ความชุกและปัจจัยเสี่ยง
รหัสโครงการ	130/2551
ชื่อหัวหน้าโครงการ	นายภูวดล กูรมะสุวรรณ
ที่ทำงาน	หลักสูตร วิทยาศาสตรมหาบัณฑิต สาขาโรคติดเชื้อและวิทยาการระบาด คณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล 420/1 ถนนราชวิถี กรุงเทพมหานคร

ขอรับรองว่าโครงการดังกล่าวข้างต้นได้ผ่านการพิจารณาเห็นชอบโดยสอดคล้องกับคำประกาศเฮลซิงกิ จากคณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ คณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล

ลงนาม .....
(ผู้ช่วยศาสตราจารย์ประมุข โอศิริ)
ประธานคณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์

ลงนาม .....
(รองศาสตราจารย์พิทยา จารุพูนผล)
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