BLOOD PRESSURE PREDICTION MODEL FOR HYPERTENSIVE PATIENTS AT SARABURI HOSPITAL IN 2009

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A Thesis Submitted in Partial Fulfillment of the Requirements
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แบบจำลองการทำนายระดับความดันโลหิตในผู้ป่วยความดันโลหิตสูงที่โรงพยาบาลสระบุรีในปี 2552

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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อนงค์นาฏ เสียมไหม : แบบจำลองการทำนายระดับความดันโลหิตในผู้ป่วยความดันโลหิตสูงที่โรงพยาบาลสระบุรีในปี 2552 (BLOOD PRESSURE PREDICTION MODEL FOR HYPERTENSIVE PATIENTS AT SARABURI HOSPITAL IN 2009) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: รศ.ดร. ฐิตินันท์ เอื้ออำนวย, 81 หน้า

วัตถุประสงค์ของงานวิจัยนี้คือ (1) เพื่อเปรียบเทียบค่าเฉลี่ยของแคลอรี่ที่ถูกเผาผลาญด้วยการออกกำลังกาย การใช้ยาตามสั่ง พฤติกรรมการรับประทาน ความรู้เรื่องโรคความดันโลหิตสูง อายุ และระดับความดันโลหิตระหว่างเพศ (2) เพื่อหาความสัมพันธ์ระหว่างแคลอรี่ที่ถูกเผาผลาญด้วยการออกกำลังกาย การใช้ยาตามสั่ง พฤติกรรมการรับประทาน ความรู้เรื่องโรคความดันโลหิตสูง อายุ และระดับความดันโลหิต (3) เพื่อหาแบบจำลองการทำนายระดับความดันโลหิตด้วย Hierarchical stepwise multiple regression analysis (MRA) การศึกษานี้เป็นวิจัยเชิงสำรวจโดยการสัมภาษณ์และข้อมูลทางคลินิกของผู้ป่วยโรคความดันโลหิตสูงจำนวน 200 รายที่มารับการตรวจรักษาที่โรงพยาบาลสระบุรี เพื่อหาความสัมพันธ์ระหว่างปัจจัยพฤติกรรมสุขภาพได้แก่ แคลอรี่ที่ถูกเผาผลาญด้วยการออกกำลังกาย การใช้ยาตามสั่ง พฤติกรรมการรับประทาน ความรู้เรื่องโรคความดันโลหิตสูง ข้อมูลประชากรศาสตร์ และระดับความดันโลหิต กลุ่มตัวอย่างสุ่มโดยคอมพิวเตอร์ ผลการศึกษาพบว่ากลุ่มตัวอย่างทั้งหมด 200 ราย ส่วนใหญ่เป็นหญิง 118 คน (ร้อยละ 59) ชาย 82 คน (ร้อยละ 41) อายุเฉลี่ย 55.21 $\pm$ 12.01 ปี การเผาผลาญแคลอรี่ด้วยการออกกำลังกายเฉลี่ยต่ออาทิตย์ 2,787.24 $\pm$ 141.61 คะแนนการใช้ยาตามสั่งเฉลี่ย 7.41 $\pm$ 1.93 คะแนนเรื่องพฤติกรรมการรับประทานเฉลี่ย 6.33 $\pm$ 1.14 ระดับความดันโลหิตค่าบนเฉลี่ย 150.24 $\pm$ 18.49 มิลลิเมตรปรอทและระดับความดันโลหิตค่าล่างเฉลี่ย 89.40 $\pm$ 9.15 มิลลิเมตรปรอท ค่า Cronbach's alpha coefficient ของ Sorofman ในมิติ "การใช้ยาตรงตามเวลา" และมิติ "การใช้ยาตรงตามปริมาณ" มีค่า 0.7978 และ 0.7896 ตามลำดับและค่าของ Auamnoy Eating Bchavior Scale เท่ากับ 0.7915 ใช้ ANOVA เปรียบเทียบค่าเฉลี่ยของระดับความดันโลหิต การใช้ยาตามสั่ง ความรู้เรื่องโรคความดันโลหิตสูง ปริมาณแคลอรี่ที่ถูกเผาผลาญด้วยการออกกำลังกาย และอายุ ระหว่างหญิงและชาย พบว่าไม่มีความแตกต่างอย่างมีนัยสำคัญทางสถิติ ($p > 0.05$) แต่พบว่าพฤติกรรมการรับประทานมีความแตกต่างอย่างมีนัยสำคัญทางสถิติ ($p = 0.05$) Pearson's correlation พบว่า อายุและพฤติกรรมการรับประทานมีความสัมพันธ์แบบผันตามอย่างมีนัยสำคัญทางสถิติกับระดับความดันโลหิตค่าบนของผู้ป่วย (r=*+0.16, **+0.59, R^2= 0.03, 0.35 ด้วยค่า $p = 0.02, 0.00$ ตามลำดับ) ส่วนแคลอรี่ที่ถูกเผาผลาญด้วยการออกกำลังกายและการใช้ยาตามสั่งมีความสัมพันธ์แบบผกผันอย่างมีนัยสำคัญทางสถิติกับระดับความดันโลหิตค่าบนของผู้ป่วย (r= **-0.81, **-0.98, R^2= 0.66, 0.96 ด้วยค่า $p = 0.00, 0.00$ ตามลำดับ) และ Pearson's correlation พบว่าอายุ แคลอรี่ที่ถูกเผาผลาญด้วยการออกกำลังกายและการใช้ยาตามสั่งมีความสัมพันธ์แบบผกผันอย่างมีนัยสำคัญทางสถิติกับระดับความดันโลหิตค่าล่างของผู้ป่วย (r= **-0.19, **-0.43, **-0.60, R^2= 0.04, 0.18, 0.36 ด้วยค่า $p = 0.00, 0.00, 0.00$ ตามลำดับ) แต่พฤติกรรมการรับประทานมีความสัมพันธ์แบบผันตามกับระดับความดันโลหิตค่าล่างอย่างมีนัยสำคัญทางสถิติ (r=**+0.53, R^2= 0.28, $p = 0.00$) MRA พบว่าการใช้ยาตามสั่ง (Beta = -0.90, -0.70) พฤติกรรมการรับประทาน (Beta = 0.82, 0.72) และแคลอรี่ที่ถูกเผาผลาญด้วยการออกกำลังกาย (Beta = -0.11, -0.29) $P = 0.00, 0.00, 0.00$ R^2= 0.58, 0.55) เป็นปัจจัยที่เป็นตัวทำนายระดับความดันโลหิตทั้งค่าบนและค่าล่างอย่างมีนัยสำคัญทางสถิติ บทสรุป: พฤติกรรมการรับประทาน แคลอรี่ที่ถูกเผาผลาญด้วยการออกกำลังกายและการใช้ยาตามสั่ง เป็น 3 ปัจจัยที่มีอิทธิพลมากอย่างมีนัยสำคัญในการทำนายระดับความดันโลหิต

ภาควิชา เภสัชศาสตร์สังคมและบริหาร
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ปีการศึกษา 2552

ลายมือชื่อนิสิต อนงค์นาฏ เสียมไหม
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5176852433: MAJOR SOCIAL AND ADMINISTRATIVE PHARMACY
KEYWORDS: BLOOD PRESSURE/ HYPERTENSION/ COMPLIANCE/ CALORIES/ EXERCISE

ANONGNART SIEMMAI: BLOOD PRESSURE PREDICTION MODEL FOR HYPERTENSIVE PATIENTS AT SARABURI HOSPITAL IN 2009. THESIS ADVISOR: ASSOC. PROF. TITINUN AUAMNOY Ph.D., 81 pp.

The objectives of this study were to (1) Compare means of calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension, age and blood pressure between gender. (2) Find correlations between calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension, age and blood pressure. (3) Estimate hierarchical stepwise multiple regression analysis (MRA) model to predict blood pressure. A retrospective research by face to face interview and accessing clinical data were employed to investigate relationship between health behavior factors namely—calories burnt by exercise, medication compliance, eating behavior score, demographic data and blood pressure of 200 hypertensive patients at Saraburi hospital 2009, randomly generated by computer. This study found that total sample size of 200 (100%) hypertensive patients, mostly 118 (59%) were female, 82 (41%) were male with average age 55.21 ± 12.01 years, average calories burnt per week 2787.24 ± 141.61, average medication compliance score 7.41 ± 1.93, average eating behavior score 6.33 ± 1.14 average Systolic blood pressure 150.24 ± 18.49 and average Diastolic blood pressure 89.40 ± 9.15. Cronbach's Alpha coefficient of Sorofman's Compliance scale for constructs "right time" and "right amount" were 0.7978 and 0.7896 respectively and Auamnoy Eating Behavior Scale was 0.7915. One Way ANOVA confirmed that blood pressure, medication compliance, knowledge about hypertension, age and calories burnt by exercise between male and female were not significantly different ($p > 0.05$). But eating behavior score between male and female were significantly different ($p = 0.05$). Pearson's product moment correlation confirmed that age and eating behavior score were significantly positively correlated with Systolic blood pressure (r=*+0.16, **+0.59, R^2= 0.03, 0.35 with p = 0.02, 0.00 respectively). Calories burnt by exercise and medication compliance were significantly negatively correlated with Systolic blood pressure (r= **-0.81, **-0.98, R^2 = 0.66, 0.96 with p = 0.00, 0.00 respectively). Correlation confirmed that age, calories burnt by exercise and medication compliance significantly inversely related with Diastolic blood pressure (r= **-0.19, **-0.43, **-0.60, R^2 = 0.04, 0.18, 0.36 with p = 0.00, 0.00, 0.00 respectively) but eating behavior score significantly related with Diastolic blood pressure (r=**+0.53, R^2 = 0.28 with p = 0.00). Hierarchical stepwise multiple regression analysis estimated the prediction equations. The three most significant variables those predicted Systolic blood pressure and Diastolic blood pressure were: medication compliance (Beta = -0.90,-0.70), eating behavior score (Beta = 0.82, 0.72) and calories burnt by exercise (Beta = -0.11, -0.29) P = 0.00, 0.00, 0.00 R^2 = 0.58, 0.55) respectively. Conclusion: eating behavior, calories burnt by exercise and medication compliance were three significantly most influence factors for predicting blood pressure.

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LIST OF ABBREVIATIONS

BP	Blood Pressure
CVD	Cardiovascular Disease
HCTZ	Hydrochlorothiazide
MET	Metabolic Equivalent
MRA	Multiple Regression Analysis
NSAIDs	Non steroidal anti inflammatory drugs
One Way ANOVA	One Way Analysis of Variance
SAFE	the Survey of Activity, Fitness and Exercise
SD	Standard Deviation
Se DBP	Seated Diastolic Blood Pressure
Se SBP	Seated Systolic Blood Pressure
SPSS	Statistical Package for the Social Sciences
WHO	World Health Organization

CHAPTER I

INTRODUCTION

1.1 Rational and background

Hypertension is an important risk factor for death, stroke and cardiovascular disease and a major cause of end-stage renal disease (Karen et al., 2008). In 2005, reported from World Health Organization estimated 17.5 million people died from cardiovascular disease and in 2015, almost 20 million people will die from cardiovascular disease, mainly from heart disease and stroke (World Health Organization, 2007). Hypertension is the major public health problem in Thailand because it has continually increased in Thai population. In Thailand, from 2001 cardio/ cerebrovascular disease had 37,654 cases per 100,000 population and increased in 2004 had 62,101 cases per 100,000 population (World Health Organization, Country Office for Thailand Bangkok, 2008-2011).

Hypertension affects approximately 50 million individuals in the United States and approximately 1 billion worldwide. As the population ages, the prevalence of hypertension will increase even further unless broad and effective preventive measures are implemented. Recent data from the Framingham Heart Study suggested that individuals who are normotensive at age 55 have a 90 percent lifetime risk for developing hypertension (Vason et al., 2002).

The relationship between blood pressure and risk of cardiovascular disease events is continuous, consistent, and independent of other risk factors. The higher of blood pressure, the greater is the chance of heart attack, heart failure, stroke, and kidney disease. For individuals 40–70 years of age, each increment of 20 mmHg in systolic blood pressure (SBP) or 10 mmHg in diastolic blood pressure (DBP) doubles the risk of cardiovascular disease across the entire blood pressure range from 115/75 to 185/115 mmHg (Lewington et al., 2002).

The guidelines of the Joint National Committee 7 from the USA (JNC 7) on

hypertension have defined as “normal blood pressure” (systolic blood pressure (SBP) <120 mmHg and diastolic blood pressure (DBP) <80 mmHg) “pre hypertension” (SBP 120 to 139 mmHg or DBP 80 to 89 mmHg)” stage I hypertension” (SBP 140 to 159 mmHg or DBP 90 to 99 mmHg)” stage II hypertension” (SBP ≥160 mmHg or DBP ≥ 100 mmHg) (JNC7 guideline, 2003).

The list of risk factors mentioned for hypertension in various sources includes: Obesity, Overweight, Diabetes, Age, Race - African Americans have a higher risk than Caucasians, Family history of high blood pressure, High-normal blood pressure, High salt diet, High saturated fat diet, Lack of exercise, Poor physical fitness, Alcohol, Alcoholism, Stress, Inactivity.

1.2 Significant of the problem

Hypertension is the major public health problem in Thailand because it has continually increased in Thai population. Hypertension is an under-diagnosed condition because it causes damage to the body with no symptoms or only mild symptoms. It has been called a "silent killer" for this reason. Unless hypertension is severe, lifestyle changes are strongly recommended before initiation of drug therapy. Adoption of the Dietary Approaches to Stop Hypertension (DASH) eating plan (Sacks et al., 2001) which is rich in potassium and calcium,(Vollmer et al.,2001) dietary sodium reduction (Chobanian, 2000; Sacks et al., 2001; Vollmer et al.,2001), physical activity, (Kelley, 2000; Whelton et al., 2002) and moderation of alcohol consumption (Xin et al., 2001). It was obvious that a population health approach “prevention is better than cure” would be the most appropriate model to adopt to deal with this ubiquitous health problem and to reduce the costs of hospitalization, long-term medication and rehabilitation. The prophylactic measures must be dealt with collectively because there is overwhelming evidence that the occurrence of cardiovascular disease can be reduced by approximately 80% by making lifestyle modifications. The preventive strategies against cardiovascular disease must be targeted at a primary health promotion level before some of the important underlying causes of cardiovascular disease seriously afflict a person or a population at large

(Harpal et al., 2005). In pharmacist role, decreasing of public health care cost and allowing people to have the greatest mobility, exercise, diet, and prevention are keys.

1.3 Objective

The objectives of this study were to:

1. To compare means of calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension, age and blood pressure between gender (male and female).

2. To find correlations between calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension, age and blood pressure.

3. To estimate hierarchical stepwise multiple regression analysis model to predict blood pressure.

1.4 Expected contributions

1. The influential factors affecting blood pressure in hypertensive patients would be identified.

2. An accurate prediction model for blood pressure in hypertensive patients would be presented.

1.5 Research question

When controlling for drug (Hydrochlorothiazide):

1. Did hypertensive patient male and female have different calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension, age, blood pressure?

2. Could (calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension and age) individually predict blood pressure in hypertensive patients? In other words were there any significant correlation between (calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension and age) and blood pressure?

3. What factors significantly predicted blood pressure in hypertensive patients?

CHAPTER II
LITERATURE REVIEW

This chapter is composed of four sections. The first section describes regarding hypertension disease. The second section reviews related literatures that studied regarding influenced factors on hypertension treatment and treatment outcome. The third section offers theoretical framework. The last section presents conceptual model of this study.

2.1 Hypertension Disease

2.1.1 Definition of hypertension

Hypertension is a chronic medical condition in which the blood pressure is elevated. Persistent hypertension is one of the risk factors for strokes, heart attacks, heart failure and arterial aneurysm, and is a leading cause of chronic renal failure (Pierdomenico et al., 2009). Even moderate elevation of arterial blood pressure leads to shortened life expectancy. At severely high pressures, defined as mean arterial pressures 50% or more above average, a person can expect to live no more than a few years unless appropriately treated (Guyton and Hall, 2005).

Hypertension leads to significant cardiovascular morbidity and mortality worldwide. Blood pressure control is critical in reducing end-organ complications such as stroke, myocardial infarction, heart failure, and kidney disease. Currently available antihypertensive agents work by different mechanisms to reduce blood pressure (Lam, 2007) which will be mentioned later in this research.

The various other types of hypertension are defined by Mark, (2007) and Alagappan, (2002) as the followings.

1. Isolated systolic hypertension is hypertension in which only the systolic (upper) reading is high. This occurs in people over age 65 and it is caused by hardening of the arteries.

2. White coat hypertension is caused by a person's anxiety or stress levels being very high. Some people get anxious and have high blood pressure readings whenever they see doctors.

3. Labile hypertension is hypertension that sometimes patients have arterial pressure within the hypertension range, are called as having labile hypertension.

4. Malignant hypertension is a rare form of hypertension that is an emergency situation. Its symptoms set in very quickly and there is a risk of seizures, stroke or even death.

5. Pseudo hypertension is a false increase in blood pressure recording due to stiff and noncompliant vessels, occuring in old age. In these individuals, actual intra-arterial blood pressure is lower than the blood pressure measured by a sphygmomanometer.

6. Accelerated hypertension is a significant recent increase in blood pressure over previous hypertension levels, associated with evidence of vascular damage on fundoscopic examination, but without papilledema.

7. Hypertension urgency is a situation in which the blood pressure is markedly elevated, but without any evidence of end organ damage. In this condition the control of the elevated blood pressure can be done gradually.

8. Hypertension emergency is a situation in which the blood pressure is markedly elevated, but with evidence of some end organ damage. In this condition, the control of the elevated blood pressure has to be done immediately.

9. Transient hypertension is systemic hypertension seen for a transient phase of time when the patient is under stress or when he is having disorder with a transient hypertension phase, as may occur in conditions like

a) Acute cerebrovascular accident
b) Acute myocardial infarction
c) Acute glomerulonephritis
d) Acute intermittent porphyria
e) Pregnancy.

10. Episodic or paroxysmal hypertension is seen in pheochromocytoma. However, a patient with pheochromocytoma may be normotensive, hypotensive or hypertension.

11. Parodoxical hypertension is a form of hypertension, patients paradoxically shows an increase in blood pressure, even when on antihypertensive drugs. For example patients with diabetes and hypertension, on beta blockers, on developing hypoglycemia show a paradoxical rise in over previously well-controlled blood pressure. This is because the excess adrenaline released secondary to hypoglycemia, act unopposed the α-1 receptors and thereby rasing the blood pressure.

12. Hypertension state is situation in which is a marked increase in both diastolic blood pressure, occuring in normal individuals as during sexual intercouse or in diving in to cold water.

13. Postural hypertension is a type of hypertension. When blood pressure is recorded in different position i.e. in lying, sitting and standing position and if there is a fall in systolic blood pressure of more than 20 mmHg after standing for three minutes from the lying posture, the patient said to have postural hypertension.

2.1.2 Classification of hypertension

2.1.2.1 JNC 7 Guideline

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7 Guideline) was established in 2003. It defined blood pressure between 120/80 mmHg as normal blood pressure and 139/89 mmHg as prehypertension. Hypertension is likely to present when a person's systolic blood pressure is consistently 140 mmHg or greater with or without a diastolic blood pressure of 90 mmHg or greater. Further it states individuals with prehypertension are at high risk of developing hypertension (JNC7 Guideline, 2003). Classification of blood pressure is given in Table 2.1

Table 2.1: JNC7 Guideline (Chobanian et al., 2003)

BP Classification	SBP (mmHg)	DBP (mmHg)
Normal	<120	and <80
Prehypertension	120-139	or 80-89
Stage 1 Hypertension	140-159	or 90-99
Stage 2 Hypertension	≥160	or ≥100

BP = blood pressure

SBP = systolic blood pressure

DBP = diastolic blood pressure

2.1.2.2 BHS, ESH and WHO/ISH Guideline

The classification of The British Hypertension Society (BHS), The European Society of Hypertension-European Society of Cardiology (ESH) and The World Health Organization-International Society of Hypertension (WHO/ISH) are similar. The details of these guidelines are shown in Table 2.2 (Williams et al., 2004, ESH Guideline, 2003 and WHO/ISH Guideline, 1999).

Table 2.2: BHS, EHS and WHO/ISH Guidelines (Williams et al., 2004, ESH Guideline., 2003 and WHO/ISH Guideline., 1999).

Category	SBP (mmHg)	DBP (mmHg)
Optimal BP	<120	<80
Normal BP	<130	<85
High-normal BP	130-139	85-89
Grade 1 Hypertension (mild)	140-159	90-99
Grade 2 Hypertension (moderate)	160-179	100-109
Grade 3 Hypertension (severe)	≥180	≥110
Isolated Systolic Hypertension (Grade 1)	140-159	<90
Isolated Systolic Hypertension (Grade 2)	≥160	<90

2.1.3 Signs and symptoms of hypertension

Mild to moderate essential hypertension is usually asymptomatic. Accelerated hypertension is associated with headache, somnolence, confusion, visual disturbances, and nausea and vomiting (hypertension encephalopathy). Retinas are affected with narrowing of arterial diameter to less than 50% of venous diameter, copper or silver wire appearance, exudates, hemorrhages, or papilledema (Zeller et al., 1989; Chiang et al., 1998; Pitts et at., 1998; Decker et al., 2006; Rogers et al., 2007).

The typical attack lasts from minutes to hours and is associated with headache, anxiety, palpitation, profuse perspiration, pallor, tremor, and nausea and vomiting. Blood pressure is markedly elevated, and angina or acute pulmonary edema may occur. In primary aldosteronism, patients may have muscular weakness, polyuria, and nocturia due to hypokalemia. Chronic hypertension often leads to left ventricular hypertrophy, which can present with exertional and paroxysmal nocturnal dyspnea. Cerebral involvement causes stroke due to thrombosis or hemorrhage from microaneurysms of small penetrating intracranial arteries. Hypertension encephalopathy is probably caused by acute capillary congestion and exudation with cerebral edema, which is reversible (Papadakis, 2008)

Signs and symptoms associated with pre-eclampsia and eclampsia, can be proteinuria, edema, and hallmark of eclampsia which is convulsions, Other cerebral signs may precede the convulsion such as nausea, vomiting, headaches, and blindness.

2.1.4 Etiology

In 95% of hypertension causes are unknown and termed as essential hypertension. However in 5% cases have specific case and are called as secondary hypertension.

2.1.4.1 Primary hypertension (Tierrney et al., 2004)

Primary hypertension has a multifactorial etiology. Genetic factor play an important role. Children with one-and more so with two-hypertension parents have higher Blood Pressure. Environmental factors also are significant. Increased salt intake and obesity have long been incriminated. These factors alone are probably not sufficient to raise blood pressure to abnormal levels but are synergistic with a genetic predisposition. Other factors that may be involved in the etiology of hypertension are following

a) Sympathetic nervous system hyperactivity
b) Renin-angiotensin system
c) Defect in natriuresis
d) Intracellular sodium and calcium levels
e) Environmental factor like obesity, sodium intake, alcohol intake, smoking, stress

2.1.4.2 Secondary hypertension (Black et al., 2001; Williams, 2001)

Secondary hypertension is hypertension that is caused by an underlying medical condition. There are several causes of secondary hypertension. The most common causes of hypertension are renal, endocrine, neurogenic and drugs.

Main article: Pathophysiology of hypertension

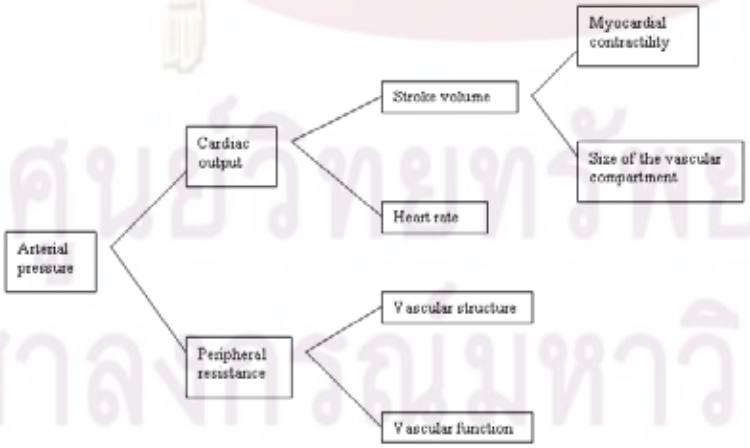


Figure 2.1: explaining factors affecting arterial pressure

Most of the mechanisms associated with secondary hypertension are generally fully understood. However, those associated with essential (primary) hypertension are

far less understood. What is known is that cardiac output is raised early in the disease course, with total peripheral resistance (TPR) normal; over time cardiac output drops to normal levels but TPR is increased.

2.1.5 Diagnosis

Initial assessment of the hypertension patient should include a complete history and physical examination to confirm a diagnosis of hypertension. Most patients with hypertension have no specific symptoms referable to their blood pressure elevation. Although popularly considered a symptom of elevated arterial pressure, headache generally occurs only in patients with severe hypertension characteristically, a "hypertension headache" occurs in the morning and is localized to the occipital region. Other nonspecific symptoms that may be related to elevated blood pressure include dizziness, palpitations, easy fatiguability, and impotence.

The diagnosis of hypertension is completely based on the multiple blood pressure measurements, taken on separate occasions under nonstressful circumstances, preferably over a period of several weeks unless it is too high i.e. >210/120 (Black et al., 2001).

Blood pressure measurement: Many expert panels have made recommendations regarding the methodology of blood pressure measurement, that frequently do not agree in all details, but several general principles can be extracted: (Black et al., 2001; Scottish Intercollegiate Guideline Network, 2001; Chobanian et al., 2003; ESH Guideline, 2003; O'Brien, 2003)

Figure 2.2: Blood pressure measurement (Sphygmomanometer)

• Use a properly maintained, calibrated and validated device.

• Allow the patients to sit for at least 5 minutes in chair with feet on the floor and arm supported at heart level in a quiet room before beginning blood pressure measurement.

• Abstain the patient from smoking or tobacco use, drinking caffeine or alcohol-containing beverages, and exercise within 30 min before a blood pressure measurement.

• Remove tight clothing, support arm at heart level, ensure hand relaxed and avoid talking during procedure.

• Use proper size cuff.

• Listening over the brachial artery by using the bell of the stethoscope with minimal pressure exerted on the skin.

• The "peak inflation level" of the mercury column should be determined by using palpitation of the radial artery before the stethoscope is applied. For subsequent blood pressure measurements, cuff typically should be inflated 20 mmHg higher than the pressure at which the palpable pulse at the radial artery disappears.

• The deflection rate of column of mercury should be 2-3 mmHg. The lower rate of deflection should be used for persons with heart rate less than 72 beat per minute (bpm); the more rate of deflection is appropriate only for tachycardia. If the precision of measurement is to be at least 2 mmHg, observer should have the opportunity to hear at least one Korotkoff sound at each 2-mmHg gradation of the mercury column.

• Measurements of blood pressure in both arms typically are obtained at the initial visit, and the arm with the higher blood pressure is used thereafter if the difference is greater than 10/5 mmHg.

• Take the mean of at least two readings. More reading are needed if marked differences between initial measurements are found.

• Check blood pressure first by palpitation to avoid the "silent gap".

Recommendations for follow up: Recommends based on initial blood pressure measurements for adults without acute end organ damage is described in below Table 2.3 (Chobanian et al., 2003; Williams et al., 2004).

Table 2.3: Recommendation for follow up (Chobanian et al., 2003; Williams et al., 2004).

Class of hypertension	Blood pressure	Follow up Recommendation
Normal	<130/85	Recheck in 5 years
High normal	130-139/85-89	Recheck in 1 year
Stage 1 Hypertension	140-159/ 90-99	Confirm within 2 months
Stage 2 Hypertension	≥160/100	Evaluate or refer to source of care within 1 month

2.1.6 Complications of hypertension

Hypertension is usually symptom less but should be treated to reduce the risk of developing complications. The major complications due to hypertension are

a) Cardiovascular complications: Like Myocardial Infarction (MI), angina, Congestive Heart Failure (CHF), Left Ventricular Hypertrophy (LVH), left ventricular dysfunction

b) Cerebrovascular diseases: Like ischemic stroke, hemorrhagic stroke, transient ischemic attack, and dementia.

c) Renal disease

d) Peripheral vascular disease

e) Aortic aneurysm

f) Retinopathy

g) Accelerated (malignant) hypertension.

2.1.7 Treatment of hypertension

2.1.7.1 Goals of treatment (Chobanian et al., 2003; ESH Guideline., 2003; Williams et al., 2004): The goals of treatment of hypertension patients are

a) Primarily to reduce the risk of cardiovascular and renal morbidity and mortality

b) Secondarily attaining of the target blood pressure <140/90 mmHg to reduce the cardiovascular complications. In patients having hypertension with diabetes or renal disease the goal of attaining target blood pressure is <130/80 mmHg.

Neal reported in 2000 that antihypertensive therapy has been associated with reductions in stroke incidence averaging 35–40 percent; myocardial infarction, 20–25 percent; and heart failure, more than 50 percent (Neal et al., 2000). It was estimated that in patients with stage 1 hypertension (SBP 140–159 mmHg and/or DBP 90–99 mmHg) and additional cardiovascular risk factors, achieving a sustained 12 mmHg reduction in SBP over 10 years would prevent 1 death for every 11 patients treated. In the presence of CVD or target organ damage, only 9 patients would require such BP reduction to prevent a death (Ogden et al., 2000).

The elderly patients (age >50 years old) with hypertension the primary focus should achieve the SBP goal. In patients with hypertension and diabetes or renal disease, the blood pressure goal is <130/80 mmHg (National Kidney Foundation Guideline, 2002; American Diabetes Association., 2003).

2.1.7.2 Lifestyle modifications: Lifestyle modifications are an important intervention both from a public health perspective and in the routine management of the individual hypertension patient. Nevertheless, lifestyle modifications must be pursued as the first-line in the management of hypertension since such therapies are safe, inexpensive and, when combined with pharmacotherapy, may result in better blood pressure control and improved quality of life. A variety of lifestyle modifications have been shown, in clinical trials, to lower blood pressure (Ebrahim, 1998).

2.1.7.3 Pharmacological treatment: There are many groups of antihypertensive, which—by varying means—act by lowering blood pressure (which lowers the blood pressure by different mechanism). However, these agents differ in side effect profiles, cost and efficacy; especially, the efficacy in preventing the important "endpoints" of hypertension such as heart attack, stroke and heart failure.

1. ACE inhibitors such as captopril, enalapril, fosinopril, lisinopril, quinapril, ramipril
2. Angiotensin II receptor antagonists such as telmisartan, irbesartan, losartan, valsartan, candesartan
3. Calcium channel blockers such as nifedipine, amlodipine, diltiazem, verapamil
4. Diuretics such as bendroflumethiazide, chlortalidone, hydrochlorothiazide (also called HCTZ), furosemide or spironolactone
5. Alpha blockers such as prazosin, terazosin, doxazosin
6. Beta blockers such as atenolol, labetalol, metoprolol, propranolol
7. Direct renin inhibitors such as aliskiren

The combination products usually contain HCTZ and one other drug. The advantage of fixed dose combinations resides in the fact that they increase compliance with treatment by reducing the number of pills taken by the patients. A fixed dose combination of the ACE inhibitor (perindopril) and the calcium channel blocker (amlodipine), recently been proved to be very effective even in patients with additional impaired glucose tolerance and in patients with the metabolic syndrome (Widimsky, 2009).

2.1.7.4 Choice of pharmacological agents: The JNC7 Guideline gave recommendations for managing hypertension. According to the guideline, thiazide-type diuretic is the first-line antihypertensive choice for most patients. The other first-line treatment options are angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), calcium-channel blockers, beta-blockers, and combination therapy with >1 of these potential first-line treatment choices. For patients with compelling indications such as diabetes, heart failure (HF), post-myocardial infarction (MI), and chronic kidney disease (CKD) (defined as an estimated glomerular filtration rate (GFR) <60 mL/min/1.73 m^2, serum creatinine >1.3 mg/dL in women or >1.5 mg/dL in men, >200 mg albumin/g creatinine, or urinary albumin excretion >300 mg/d), the JNC 7 guideline included more specific recommendations regarding drug choice.

2.2 Related literature reviews

There were many factors that make people develop to hypertension or treatment of hypertensive outcome was unsuccessful such as diet (patient eating behavior), calories burnt by exercise, patient life behavior change such as smoking and drinking alcohol, knowledge about hypertension of patient and medical regimen compliance.

2.2.1. Diet and Patient eating behavior

Diet and patient eating behavior were important factor that influence risk of hypertension and treatment outcome. Jens and colleagues concluded that individuals blood pressure increasing varied to increasing salt intake; individuals with renal disease were particularly salt sensitive. Moreover, salt causes major alterations of renal hemodynamics and accelerates progression (Jens et al., 2009). Judith and colleagues studied in 4,874 participants and found that blood pressure reductions were -1.05 mm Hg systolic and -0.92 mm Hg diastolic when expressed per kilogram of weight loss (Judith et al., 2003). Theodore and colleagues found that the impact of dietary salt on blood pressure might be affected by consumption of potassium or calcium. The urine sodium-potassium ratio was a stronger correlate of blood pressure than either sodium or potassium alone. In addition, high sodium intake was associated with higher blood pressure levels among persons consuming low-calcium diets (Theodore et al., 1998). George and colleagues suggested that a marked change in sodium intake is required to achieve a modest reduction in blood pressure (there is a decrease of 1 mm Hg in systolic blood pressure for every 100 mmol decrease in daily sodium intake). For hypertension patients and older than 44 years old, the dietary salt restriction was recommended. A decrease of 6.3 mm Hg in systolic blood pressure and 2.2 mm Hg in diastolic blood pressure per 100 mmol decreased in daily sodium intake was observed in people older than 44 (George et al., 1999). Graudal and colleagues suggested that a high consumption of salt increased blood pressure. However, some scientists had different opinion on sodium restriction because of reducing salt consumption resulted in increasing LDL concentrations. Therefore, the antihypertensive action of restricted salt consumption might be cancelled out by

increasing in LDL concentrations (Graudal et al., 1998). Bray and colleagues assessed the effects of three dietary sodium levels on blood pressure in 412 participants. This study incorporated grade declines in sodium intake (i.e., 150 mmol/2100 kcal, 100 mmol/2100 kcal and 50 mmol/2100 kcal for 30 days) and observed respective reductions in blood pressure with each sodium intake level. The result demonstrated that sodium-restricted diets had an antihypertensive effect in people who consumed a specialized diet, as well as in the controlled group who consumed a typical American diet. The significant reductions in blood pressure observed were a mean reduction in systolic blood pressure from 5 mmHg to 8 mmHg and the mean reduction of diastolic blood pressure was between 2 mmHg to 4 mmHg. Bray and colleagues concluded that monitoring sodium intake elicit a cardio-protective effect. One drawback of this study was that the investigators failed to look at the possible consequences regarding blood lipid concentrations, which may produce adverse effects on overall cardiovascular health (Bray et al., 2002). Aviv reported that excess salt intake might cause hypertension and adversely affect the cardiovascular system and kidneys in 'salt-sensitive' people. Further more Aviv found that excess salt consumption increased the left ventricular mass and caused stiffness of the aorta. These adverse cardiovascular events suggested that caution should be exercised in choosing dietary sodium levels (Aviv, 2004). Vollmer and colleagues, (2001) studied in the short-term reduction in sodium intake might be associated with a lower long-term risk of hypertension. Control diet lower sodium intake decreased blood pressure by 7.0/3.8 mmHg in patients older than 45 years old and by 3.7/1.5 mmHg in younger patients (Vollmer et al., 2001). Aucott and colleagues recommended that for 10 kg weight loss diastolic would decrease 4.6 mmHg and systolic would decrease 6.0 mmHg (Aucott et al., 2005).

2.2.2. Regular physical activity (Exercise)

People's life style gradually changed from time to time and people did exercise less than the past. Whelton and colleagues found that the new lifestyle associated with an increased risk of cardiovascular disease. Meta-analysis of randomized controlled trial showed that a regular aerobic physical activity could reduce 1.81-3.35 mmHg and 2.72-4.97 mmHg of diastolic and systolic blood pressure respectively (Whelton et al.,

2002). Kunihiko and colleagues studied in 63 participants who with/without pre-hypertension and/or pre diabetes were divided into subjects and family doctors prescribed an individually customized lifestyle prescription for aerobic exercise and Mediterranean-style diet. Found that blood pressure and fasting blood glucose were reduced (Kunihiko et al., 2009). Hirofumi and colleagues recommended that lifestyle modifications, in particular aerobic exercise and sodium restriction, appear to be clinically efficacious therapeutic interventions for preventing and treating arterial stiffening (Hirofumi et al., 2005). Harry and colleagues studied regarding exercise in hypertension, diabetes and hyperlipidemia patients and concluded that after adjustment for other variables, patients without exercise had an odds ratio of 2.71 (95% CI, 1.38-5.32) for poor hypertension, diabetes and hyperlipidemia control compared with patients with exercise. These findings suggested that exercise by itself is important for hypertension, diabetes and hyperlipidemia management (Harry et al., 2002). Rowland stated that in comparison with normotensive subjects, systolic blood pressure was decreased by up to 8 mmHg and diastolic blood pressure was decreased by up to 6 mmHg with the adoption of physical activity in hypertension patients. Younger and older subjects who tended to have sedentary lifestyles risked an increase in blood pressure over time, whereas those who were physically active seemed to evade this adverse effect (Rowland, 2001)

2.2.3. Making Life behavior changes

Lifestyle changes or non-pharmacological treatment was the choice in the treatment of patients with hypertension. Laura P. and colleagues studied in 574 patients. Patient intervention included 20 weekly group sessions followed by 12 monthly telephone counseling contacts and focused on weight loss, Dietary Approaches to Stop Hypertension dietary pattern, exercise, and reduced sodium intake. The primary outcome was change in systolic blood pressure at 6 months. Blood pressure data were available for 91% of patients at 6 months. The main effect of physician intervention on systolic blood pressure at 6 months, adjusted for baseline pressure, was 0.3 mm Hg The main effect of the patient intervention was -2.6 mm Hg. The interaction of the 2 interventions was significant (Laura P. et al., 2009) Laura and

colleagues studied in 810 participants (mean [SD] age, 50 years; 62% women; 34% African American) with above-optimal blood pressure, including stage 1 hypertension (120-159 mm Hg systolic and 80-95 mm Hg diastolic), and who were not taking antihypertensive medications. Both behavioral interventions significantly reduced weight, improved fitness, and lowered sodium intake. The established plus DASH intervention also increased fruit, vegetable, and dairy intake. Across the groups, gradients in blood pressure and hypertension status were evident. After subtracting change in advice only, the mean net reduction in systolic blood pressure was 3.7 mm Hg in the established group and 4.3 mm Hg in the established plus DASH group; the systolic blood pressure difference between the established and established plus DASH groups was 0.6 mm Hg (Laura et al., 2003). The evidence showed that smoking aids the major risk factors for mortality from stroke and coronary heart disease among the elderly and very old hypertension patient (Janzon et al., 2004). Thus, it is critical that person with raised blood pressure are advised to stop smoking (Khalili, 2002). Xin and colleagues found that a meta-analysis of randomized controlled trials showed that alcohol reduction for longer duration results in reduction of 3.24 and 2.22 mmHg of systolic and diastolic blood pressure respectively (Xin et al., 2001).

2.2.4. Patient education

Patient education was an important component of hypertension treatment. Christianne and colleagues studied in 1,341 veterans with essential hypertension and found that Mean baseline blood pressure was 157/83 mm Hg with no differences between groups .Six-month follow-up data were available for 975 patients (73%). Patients of providers who were randomly assigned to the patient education group had better blood pressure control (138/75 mm Hg) than those in the provider education and alert or provider education alone groups (146/76 mm Hg and 145/78 mm Hg, respectively) (Christianne et al.,2006). Khan and colleagues suggested that for lifestyle modifications to prevent and treat hypertension, restrict dietary sodium to less than 2300 mg (100 mmol)/day (and 1500 mg to 2300 mg [65 mmol to 100 mmol]/day in hypertension patients); perform 30 min to 60 min of aerobic exercise four to seven days per week; maintain a healthy body weight (body mass index 18.5 kg/m^2 to 24.9

kg/m^2) and waist circumference (smaller than 102 cm for men and smaller than 88 cm for women); limit alcohol consumption to no more than 14 units per week in men or nine units per week in women; follow a diet that is reduced in saturated fat and cholesterol, and that emphasizes fruits, vegetables and low-fat dairy products, dietary and soluble fiber, whole grains and protein from plant sources; and consider stress management in selected individuals with hypertension (Khan et al., 2009). Yadlapalli and colleagues studied in 453 individuals and found that around 62% of respondents had heard of blood pressure. This awareness was comparatively more among women and settled-migrants and in these communities, more than a half possessed the knowledge, less than a half perceived that hypertension can be prevented, and less than a half of these followed at least one of the lifestyle changes mentioned by them (Yadlapalli et al., 2009).

2.2.5. Medical regimen compliance

Medical regimen compliances were important factor that effected to treatment outcome. Ross and colleagues examined the psychological and emotional effect of illness perceptions and treatment beliefs on patient compliance to antihypertensive medication. Patients who believed in the necessity of the medication were more likely to be compliant with antihypertensive therapy than those who felt it was unnecessary (Ross et al., 2004). Laurent and colleagues concluded that young hypertensions, large city dwellers, and smokers are more likely to be poor compliers. The presence of some of these characteristics might incite the physician either to encourage patient compliance or to prescribe antihypertensive drugs that have an effect that persists even beyond 24 hours (Laurent et al., 1999). Michel and colleagues compared the compliance of hypertensive patients treated with captopril twice daily or trandolapril once daily. Trandolapril and captopril were packed in electronic pill-boxes equipped with a microprocessor that recorded date and time of each opening (MEMS). Found that patients' compliance with once daily trandolapril was higher than with twice daily captopril (Michel et al., 2000).

2.3 Conceptual model

According to past researches, conceptual model of the study was generated. 6 variable e.g. “health behaviors” specifically—exercise, medication compliance, knowledge about hypertension and eating behavior and the additional variables such as demographic data (i.e. gender, age), were integrated to the model for predicting blood pressure.

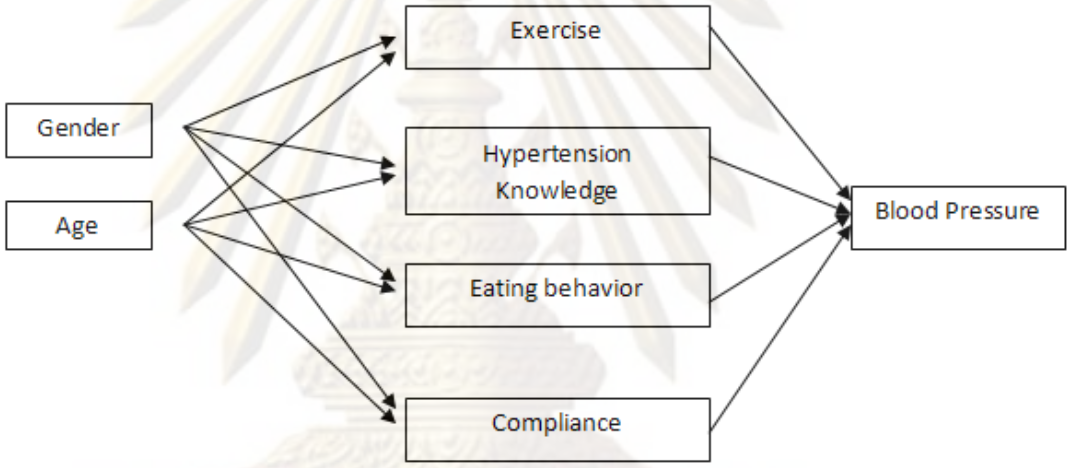


Figure 2.3: Conceptual model

The objectives of this study were to: 1. Compare means of calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension, age and blood pressure between gender. 2. Find correlations between calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension, age and blood pressure. 3. Estimate hierarchical stepwise multiple regression analysis model to predict blood pressure.

Research questions, in the hypertensive patients, when controlling for drug HCTZ.

1. Did hypertensive patient male and female have different calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension, age and blood pressure?
2. Could (calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension and age) individually predict blood pressure in hypertensive patients? In other words were there any significant correlation between (calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension and age) and blood pressure?
3. What factors significantly predicted blood pressure in hypertensive patients?

CHAPTER III
METHODOLOGY

3.1 Study design

This study was a retrospective research by face to face interview following the questionnaire guideline survey was employed to study the relationship between calories burnt by exercise, eating behavior score, knowledge about hypertension, demographic data namely—age and gender,—and seated diastolic blood pressure (SeDBP) and seated systolic blood pressure (SeSBP) in 200 hypertensive patients who visited the physician at Saraburi hospital during the period of January 1, 2009 to December 31, 2009.

3.2 Consideration of Patient Participation

The study protocol was reviewed for approval by the staff of Chulalongkorn Ethic Committee.

3.3 Population

The population framework for this study was all hypertensive patients who were prescribe Hydrochlorothiazide (HCTZ) 25 mg. once daily for hypertensive treatment during January 1, 2009 to December 31, 2009. Exclusion criteria included concomitant diseases and medications e.g., drugs known to affect blood pressure that might interfere with the assessment such as NSAIDs (Non steroidal anti inflammatory drugs). Simple random technique generated randomized sampling number by computer was employed to select samples from computerized Saraburi hospital main database.

3.4 Sampling method

The samples were the patients who were prescribed HCTZ 25 mg once daily for hypertensive treatment during January 1, 2009 to December 31, 2009.

All data from computerized Saraburi hospital main data base were in Microsoft Office Access file from two different sources (files). The first file contained HN, birthday, age, gender, occupation, ICD-10 code (Figure 3.1).

HN	Birthday	Age	Gender	Occupation	ICD code
3900562	7/6/2507	45.91	1	205	I10
3913901	10/5/2593	49.98	1	404	I10
3925350	2/7/2480	72.85	2	900	I10
3931162	18/4/2507	46.04	1	404	I10
3901522	15/5/2501	51.97	2	606	I10
3907772	6/5/2504	48.99	2	404	I10
3913667	15/4/2471	82.07	2	606	I10
3908288	7/11/2490	62.51	1	404	I10
3909028	12/10/2484	68.57	2	503	I10
3920168	5/7/2485	67.84	1	503	I10

Figure 3.1 Illustration of the first file in Microsoft Office Access from computerized Saraburi hospital main database

The second file contained HN and blood pressure (Figure 3.2).

Hn	Visitdate	Group	Lab	Code	Result
3920168	17/7/2552	BP	Bphigh	BP	158
3920168	17/7/2552	BP	Bplow	BP	86
3920168	30/12/2552	BP	Bphigh	BP	133
3920168	30/12/2552	BP	Bplow	BP	79

Figure 3.2 Illustration of the second file in Microsoft Office Access from computerized Saraburi hospital main database

These two data files were linked by HN and were retrieved in one Microsoft Office Access file. We used key words 25 mg HCTZ and ICD-10 code I10 (essential (primary) hypertension) or code I15 (secondary hypertension). It yielded 1,602 patients. Then all data were transferred from Microsoft Office Access form to Microsoft Office Excel form. We recruited only patients with SeDBP $\geq$ 80 mmHg or SeSBP $\geq$ 120 mmHg. It yielded only 1,581 patients.

3.5 Sample size calculation

The sample size recommended by Hair et al., (2000) for using Multiple Regression Analysis was 15 to 20 samples for one independent variable however sample size must not less than 100 since this study had six independent variables, we then needs at least 120 samples. However, we over calculated for losing data to 200 samples. The 200 samples were the hypertensive patients who came to see physicians during the time plan. To qualify for inclusion, a potential participant had to meet all the following requirements: 1) Literacy in Thai; 2) Having reached 18 years of age (as of January 1, 2009). Otherwise-eligible participants were excluded from the study database if (as of the closing analysis date) they displayed any one of these disqualifying factors: Died; Lost contact; Had otherwise not remained in contact with Saraburi hospital; or were currently involved in other similar studies; 4) Prescribed HCTZ for disease treatment. By setting these protocol criterions and the calculating sampling size of 200 for computer generating random sampling hypertensive patients clinical data profile with the address.

3.6 Instruments

The 6-page questionnaire consisted of 56 questions. It was divided into (5) parts: demographic data, alcohol and cigarettes consumption, blood pressure, calories burnt by exercise using Haskell Compendium of Physical Activities scale, the knowledge about hypertension scales, eating behavior score and Sorofman's compliance scale version 2.

3.7 Pretest

As part of the planned pretest of this questionnaire, 20 graduate students and 10 undergraduate students completed the survey and were then interviewed to assess its face validity and content validity. Questionnaire format was modified – largely based on suggestions from these pretest subjects. The final survey instrument and sample methodology were approved by researchers and experts.

3.8 Pilot Test

An initial interview of 20 questionnaires were performed on February 20, 2010, serving as a pilot test for the purpose of previewing the questions, and fine tuning of some peripheral aspects of the questionnaire. The pilot test responses showed a need for eating behavior score and knowledge about hypertension score modification which were done. Review of the modified questionnaire form showed these changes to enhance understanding, reliability, sensitivity, and variation of responses.

3.9 Analysis Procedure

All data were reported in the aggregate, to avoid inadvertent identification of an individual. Consideration was given to the loss of power with multiple statistical testing. Nineteen hypotheses were generated from the models in this study. The basic model for testing these fourteen hypotheses consisted of two dependent variables and seven independent variables by SPSS version 17.0

3.10 Variables

3.10.1 Dependent variables

There were two dependent variables in this study. The dependent variables were SeSBP and SeDBP. It was measured by patients 'medical records. The presence of hypertension was defined by a doctor's diagnosis, the use of HCTZ 25 mg. per day.

3.10.2 Independent variables

There were six independent variables in this study. The independent variables in this model were: gender, age, medication compliance score, eating behavior score, knowledge about hypertension and total calories burnt by exercise.

3.11 Study finding

3.11.1 Demographic data, alcohol and cigarettes consumption and blood pressure

Age, gender, education, occupation, drinking and smoking status were obtained from face to face interviewing.

Blood pressure was taken by patients 'medical records from Saraburi computer data base.

The presence of hypertension was defined by patients 'medical records, the use of anti-hypertensive medications, or SeSBP more than 120 mmHg or SeDBP more than 80 mmHg.

Alcohol intake was determined by interviewing "In any one week, how many glasses of alcohol do you drink? And also any type of alcohol beverage?"

Smoking habit was asked "How many cigarettes do you normally smoke everyday?"

3.11.2 Calories burnt by exercise

Calories burnt by exercise could be measured via Haskell Compendium of Physical Activities. It was developed for using in epidemiologic studies to standardize the assignment of Metabolic Equivalent (MET) intensities in physical activity questionnaires by Haskell (2000) at Stanford University conceptualized the Compendium and developed a prototype for the document. The instrument was used first in the Survey of Activity, Fitness, and Exercise (SAFE study - 1987 to 1989) to code and score physical activity records. Since then, it has been used in studies worldwide to assign intensity units to physical activity questionnaires and to develop innovative ways to assess energy expenditure in physical activity studies. Metabolic Equivalent: The ratio of the work metabolic rate to the resting metabolic rate. One MET is defined as 1 kcal/kg/hour and is roughly equivalent to the energy cost of sitting quietly. A MET also is defined as oxygen uptake in ml/kg/min with one MET equal to the oxygen cost of sitting quietly, equivalent to3.5ml/kg/min.

3.11.3 Eating behavior scale (version 3)

Eating behavior scale version 3 was developed from version 2 (3 attributes category ordinal scale) by Auamnoy, (2008) by using indicators to define a continuous ratio scale of eating behavior construct. Eating behavior scale was extended by adding 5 specific questions about salt diet. It yielded more face and content validity. The additional salt consumption construct (that the old scale for diabetes patients version 2 did not have) produced the larger percent variance of Blood Pressure that could be accounted for by all variables. In addition visual analog ratio scale was replaced the old category ordinal scale of version 2.

3.11.4 Sorofman Medical regimen compliance scale version 2

Sorofman Medical regimen Compliance scale version 2 was developed by Bernard Sorofman (2002). It composed of 3 questions measured 2 constructs "amount" and "punctual time".

Sorofman Medical regimen Compliance scale was more advance by tuning the questions specification for hypertensive patients.

3.12 Data analysis

Data were described as frequencies, percent, and means with standard deviations (SD.), One Way ANOVA, Pearson's product moment correlation method, and multiple regression analysis. All analyses were performed by using the SPSS program Version 17.0 with default setting— $p < 0.05$ —as the level of statistical significance.

Each of Hypotheses 1, 2, 3, 4, 5, 6 and 7 contains one dependent variable (Ratio scale) and one independent variable (Nominal scale); therefore, we applied One Way ANOVA to compare the means of SeSBP, SeDBP, medication compliance, knowledge about hypertension, age, calories burnt by exercise and eating behavior score between male and female ($P < 0.05$).

Ho:

(1) $\mu_{\text{male SeSBP}} = \mu_{\text{female SeSBP}}$

(2) $\mu_{\text{male SeDBP}} = \mu_{\text{female SeDBP}}$

(3) $\mu_{\text{male medication compliance}} = \mu_{\text{female medication compliance}}$

(4) $\mu_{\text{male knowledge about hypertension}} = \mu_{\text{female knowledge about hypertension}}$

(5) $\mu_{\text{male age}} = \mu_{\text{female age}}$

(6) $\mu_{\text{male calories burnt by exercise}} = \mu_{\text{female calories burnt by exercise}}$

(7) $\mu_{\text{male eating behavior score}} = \mu_{\text{female eating behavior score}}$

Hypotheses 8-17 have two continuous (Ratio scale) variables. The data for these hypotheses were analyzed via Pearson's product moment correlation method ($p < 0.05$).

Ho:

(8) $\rho_{\text{Age. SeSBP}} = 0$

(9) $\rho_{\text{Calories Burntby Exercise. SeSBP}} = 0$

(10) $\rho_{\text{Knowledge about hypertension. SeSBP}} = 0$

(11) $\rho_{\text{Eating behavior score. SeSBP}} = 0$

(12) $\rho_{\text{Medication compliance. SeSBP}} = 0$

(13) $\rho_{\text{Age. SeDBP}} = 0$

(14) $\rho_{\text{Calories Burntby Exercise. SeDBP}} = 0$

(15) $\rho_{\text{Knowledge about hypertension. SeDBP}} = 0$

(16) $\rho_{\text{Eating behavior score. SeDBP}} = 0$

(17) $\rho_{\text{Medication compliance. SeDBP}} = 0$

Hypothesis 18,19 has one continuous (Ratio scale) dependent variable SeSBP, SeDBP and six independent variables—gender (male), age, eating behavior score, medication compliance, calories burnt by exercise and knowledge about hypertension score—described in this equation. Statistical analysis of this data was calculated via multiple regression analysis ($p < 0.05$).

Ho 18:

$SeSBP = b_0 + b_1$ male $+ b_2$ age $+ b_3$ calories burnt by exercise $+ b_4$ eating behavior $+ b_5$ medication compliance $+ b_6$ knowledge about hypertension

$Z_{SeSBP} = b1\ Z_{male} + b2\ Z_{age} + b3\ Z_{\text{calories burnt by exercise}} + b4 Z_{\text{eating behavior score}} + b5\ Z_{\text{medication compliance}} + b6\ Z_{\text{knowledge about hypertension}}$

Ho 19:

$SeDBP = b_0 + b_1$ male $+ b_2$ age $+ b_3$ calories burnt by exercise $+ b_4$ eating behavior $+ b_5$ medication compliance $+ b_6$ knowledge about hypertension

$Z_{SeDBP} = b1\ Z_{male} + b2\ Z_{age} + b3\ Z_{\text{calories burnt by exercise}} + b4 Z_{\text{eating behavior score}} + b5\ Z_{\text{medication compliance}} + b6\ Z_{\text{knowledge about hypertension}}$

CHAPTER IV
RESULTS

This chapter showed the data analysis and interpretation. All (19) hypotheses were tested. The study outcomes were explained including tables and graphs. It started with descriptive statistical analyses, scales reliability and then the results of inference statistics were demonstrated.

The first section was the summary of descriptive analyses namely- response rate, demographic characteristics such as gender, education, marital status and occupation were illustrated in frequency and percentage all other variables in the model, all scales reliability. The second presented the results of all statistical evaluative analyses i.e. One Way Analysis of variance (ANOVA) was employed to compare means of blood pressure, medication compliance, knowledge about hypertension score, age, calories burnt by exercise and eating behavior score between gender (male and female), Pearson's product moment correlation was used to examine the relationship between age, calories burnt by exercise, knowledge about hypertension score, eating behavior score, medication compliance and blood pressure then Hierarchical stepwise multiple regression analysis was conducted to explore predictors of the model of blood pressure.

Data coding and computerize entry were accomplished and confirmed by 2 investigators. Test for data entry error was double checked by 4 investigators throughout the entire sample in every response item against its initial keyboard entry.

4.1 Descriptive statistic analyses

4.1.1 Response rate

Data from computerized Saraburi hospital main data base were retrospectively collected restricted only the hypertensive patients who were prescribed hydrochlorothiazide 25 mg once daily for hypertensive treatment for a period of

twelve months during January 1, 2009 to December 31, 2009 yielded 1,581 patients (population frame). All 1,581 patients (population) were randomly selected by using computer generated 200 numbers to be samples of this study.

The survey by face to face interview was conducted during 2-12 April 2010. There were 21 patients (10.5%) were lost contact and 1 patients (0.5%) was death therefore the next 22 samples (number 201-222) were picked up instead. The final response rate yielded **100 %** (n= 200).

4.1.2 Demographic Characteristics

The sample (n=200) consisted of hypertensive patients who were prescribed hydrochlorothiazide for hypertension treatment. The summary of demographic data namely- gender, marital status, education, occupations were shown in table 4.1.

Most of patients 118 (59%) were female and 82 (41%) were male. (The graphs was shown in Figure 4.1)

The marital statuses of the respondents 178 (89%) were married and 22 (11%) were single. (The graphs was shown in Figure 4.2)

The level of education of the respondents 97 (48.5%) were completed grade school, 45 (22.5%) were completed high school, 32 (16%) were completed junior high school, 21 (10.5%) were technical school and 5 (2.5%) were bachelor degree. (The graphs was shown in Figure 4.3)

46 (23%) the majority of respondents' occupation were house maid, 37 (18.5%) were merchant, 36 (18%) were government official, 32 (16%) were employee, 25 (12.5%) were agriculture, and 24 (12%) were retired government official. (The graphs was shown in Figure 4.4)

The average age of female respondents were 59.82$\pm$11.79 years old, ranged from 27.13 years old to 82.18 years old. The average age of male respondents were

53.66±12.16 years old, ranged from 27.78 years old to 83.20 years old. Results were shown in table 2. (The graphs was shown in Figure 4.5)

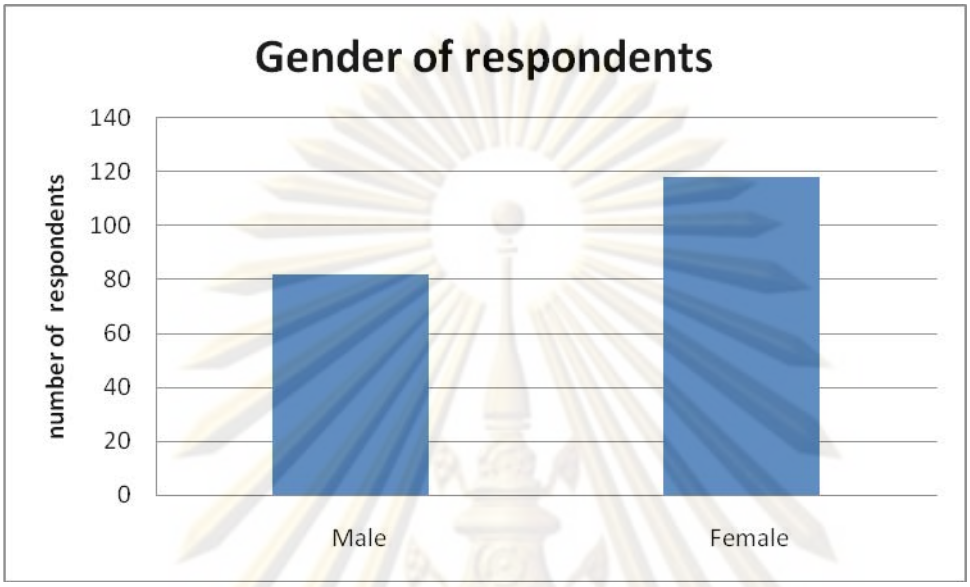
Table 4.1: Demographic data of the respondents

Demographic Characteristics	**Frequency**	**Percent**
Gender		
Female	118	59.00
Male	82	41.00
Marital Status		
Single	22	11.00
Married	178	89.00
Level of education		
Completed grade school	97	48.50
Completed high school	45	22.50
Completed junior high school	32	16.00
Technical school	21	10.50
Bachelor degree	5	2.50
Occupations		
Government official	36	18.00
Retired government official	24	12.00
Employee	32	16.00
Agriculture	25	12.50
House maid	46	23.00
Merchant	37	18.50
Total	200	100.00

Table 4.2: Age of respondents (n=200)

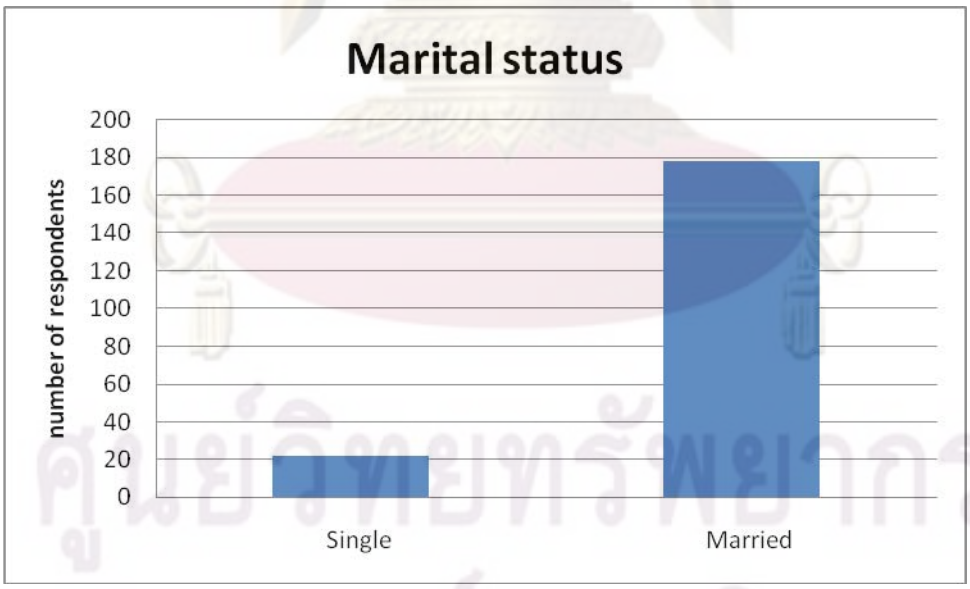
Age	**Min**	**Max**	**Mean**	**SD**
Female	27.13	82.18	59.82	11.79
Male	27.78	83.20	53.66	12.16

Figure 4.1: Gender of respondents (n=200)



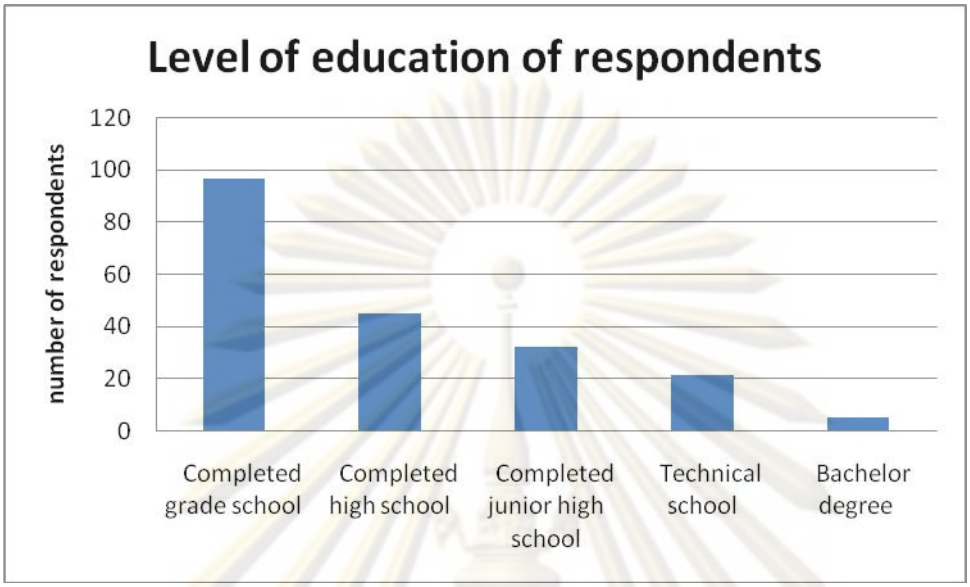
Note: 118(59%) of respondents were female; only 82(41%) were male.

Figure 4.2: Marital Status of respondents (n=200)



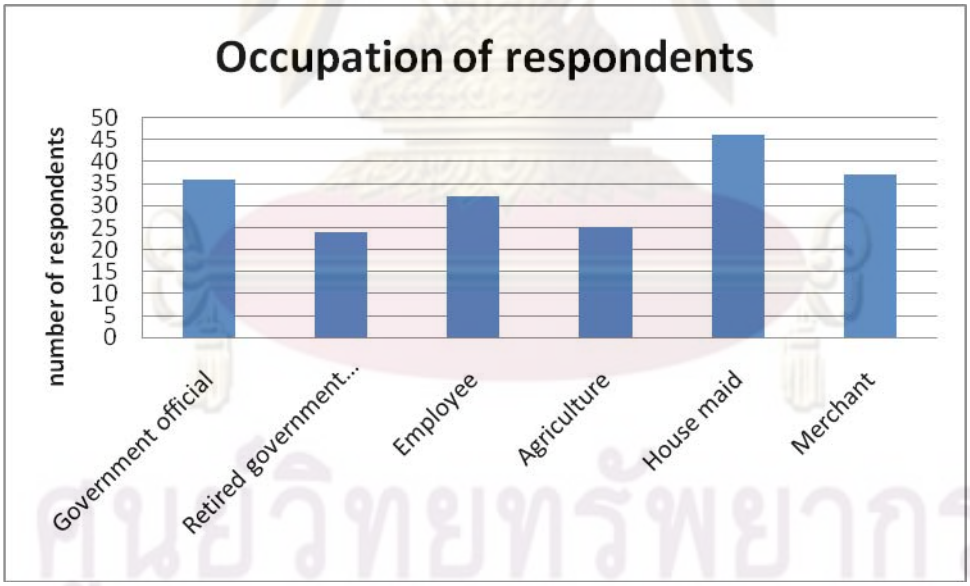
Note: 178(89%) of respondents were married; and 22(11%) were single.

Figure 4.3: Level of education of respondents (n=200)



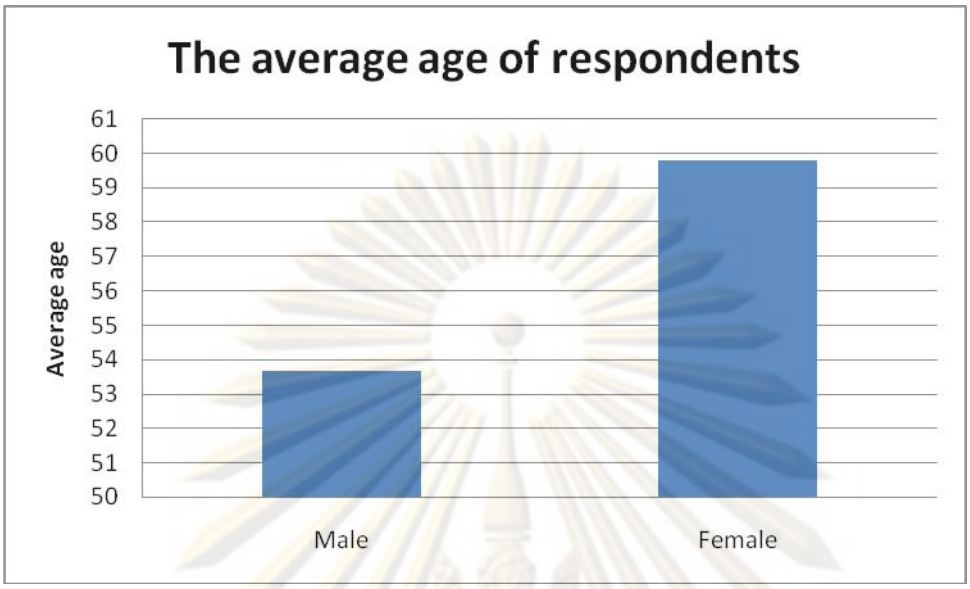
Note: The largest subgroup of respondents 97(48.50%) had completed grade school.

Figure 4.4: Occupation of respondents (n=200)



Note: The most occupation of respondents was house maid 46(23%).

Figure 4.5: The average age of respondents



Note: The average age of female was 59.82 ± 11.79 years old and the average age of male was 53.66 ± 12.16 years old.

4.1.3 The other descriptive statistical data

The average age of respondents were 55.21 ± 12.01 years old, ranged from 27.13 years old to 83.20 years old. The average Systolic Blood Pressure of respondents were 150.24 ± 18.49 mmHg, ranged from 120 mmHg to 228 mmHg. The average Diastolic Blood Pressure of respondents were 89.40 ± 9.15 mmHg, ranged from 80 mmHg to 132 mmHg. The average knowledge about hypertension score of respondents were 6.31 ± 1.57 points, ranged from 0 points to 10 points. The average calories burnt by exercise per week of respondents were 2,784.24 ± 141.61 kcal, ranged from 250 kcal to 4750 kcal. The average medication compliance score of respondents were 7.41 ± 1.93 points, ranged from 1.15 points to 9.98 points. The average eating behavior score of respondents were 5.81± 1.10 points, ranged from 3.09 points to 8.56 points. Results were shown in Table 4.3.

Table 4.3: The continuous variables descriptive statistics

	Mean	SD	Min	Max
age	55.21	12.01	27.13	83.20
Systolic Blood Pressure	150.24	18.49	120	228

Diastolic Blood Pressure	89.40	9.15	80	132
knowledge about hypertension score	6.31	1.57	0	10
calories burnt by exercise per week	2787.24	141.61	250	4750
medication compliance score	7.41	1.93	1.15	9.98
eating behavior score	6.33	1.14	3.09	8.56

4.1.4 Scale Reliability

Consistency of these scales were assessed for internal reliability with Cronbach's Alpha coefficient. The reliability coefficients of Sorofman's Compliance scale version 2 for construct "right time" and construct "right amount" were 0.7978 and 0.7896.

4.2 The evaluative analyses

4.2.1 Analysis of Hypotheses

The first (1-7) hypotheses were:

Ho:

(1) $\mu_{\text{male SeSBP}} = \mu_{\text{female SeSBP}}$

(2) $\mu_{\text{male SeDBP}} = \mu_{\text{female SeDBP}}$

(3) $\mu_{\text{male medication compliance}} = \mu_{\text{female medication compliance}}$

(4) $\mu_{\text{male knowledge about hypertension}} = \mu_{\text{female knowledge about hypertension}}$

(5) $\mu_{\text{male age}} = \mu_{\text{female age}}$

(6) $\mu_{\text{male calories burnt by exercise}} = \mu_{\text{female calories burnt by exercise}}$

(7) $\mu_{\text{male eating behavior score}} = \mu_{\text{female eating behavior score}}$

For hypotheses 1 to 7, we used One Way ANOVA statistical methods to compare means between male and female's (Blood Pressure, medication compliance, knowledge about hypertension score, age, calories burnt by exercise and eating

behavior score). The statistical significance α was set to 0.05. Results were shown in Table 4 to 15.

Table 4.4: Systolic Blood Pressure

		N	Mean	SD	Min	Max
Systolic Blood Pressure	Female	118.00	151.99	18.32	123	217
	Male	82.00	147.71	18.55	120	228

The average Systolic Blood Pressure of female respondents were 151.99 $\pm$ 18.32 mmHg, ranged from 123 mmHg to 217 mmHg. The average Systolic Blood Pressure of male respondents were 147.71 $\pm$ 18.55 mmHg, ranged from 120 mmHg to 228 mmHg.

Table 4.5: One Way ANOVA analysis of Systolic Blood Pressure

	Sum of Squares	df	Mean Square	F	p-value
Between Groups	887.99	1	887.99	2.62	0.11
Within Groups	67117.97	198	338.98		
Total	68005.96	199			

F-test of the average score of Systolic Blood Pressure between female and male was 2.62 ($p = 0.11$). Conclusion the average score of female and male were not significantly difference.

Table 4.6: Diastolic Blood Pressure

		N	Mean	SD	Min	Max
Diastolic Blood Pressure	Female	118.00	89.45	8.75	80	121
	Male	82.00	89.32	9.76	80	132

The average Diastolic Blood Pressure of female respondents were 89.45$\pm$ 8.75 mmHg, ranged from 80 mmHg to 121mmHg. The average Diastolic Blood Pressure of male respondents were 89.32$\pm$9.76 mmHg, ranged from 80 mmHg to 132mmHg.

Table 4.7: One Way ANOVA analysis of Diastolic Blood Pressure

	Sum of Squares	df	Mean Square	F	p-value
Between Groups	0.84	1	0.84	0.01	0.92
Within Groups	16676.95	198	84.23		
Total	16677.80	199			

F-test of the average score of Diastolic Blood Pressure between female and male was 0.01 (p = 0.92). Conclusion the average score of female and male were not significantly difference.

Table 4.8: Medication compliance score

		N	Mean	SD	Min	Max
Compliance	Female	118.00	7.24	1.93	1.64	9.77
	Male	82.00	7.66	1.91	1.15	9.98

The average medication compliance score of female respondents were 7.24±1.93 points, ranged from 1.64 points to 9.77 points. The average medication compliance score of male respondents were 7.66±1.91 points, ranged from 1.15 points to 9.98 points.

Table 4.9: One Way ANOVA analysis of medication compliance score

	Sum of Squares	df	Mean Square	F	p-value
Between Groups	8.35	1	8.35	2.25	0.14
Within Groups	731.24	197	3.71		
Total	739.59	198			

F-test of the average score of medication compliance score between female and male was 2.25 (p = 0.14). Conclusion the average score of female and male were not significantly difference.

Table 4.10: Knowledge about hypertension score

		N	Mean	SD	Min	Max
Knowledge	Female	118.00	6.33	1.67	0	10
	Male	82.00	6.27	1.41	3	9

The average knowledge about hypertension score of female respondents were 6.33±1.67 points, ranged from 0 points to 10 points. The average knowledge about hypertension score of male respondents were 6.27±1.41 points, ranged from 3 points to 9 points.

Table 4.11: One Way ANOVA analysis of knowledge about hypertension score

	Sum of Squares	df	Mean Square	F	p-value
Between Groups	0.19	1	0.19	0.08	0.78
Within Groups	490.21	198	2.48		
Total	490.40	199			

F-test of the average score of knowledge about hypertension score between female and male was 0.08 (p = 0.78). Conclusion the average score of female and male were not significantly difference.

Table 4.12: Calories burnt by exercise per week

		N	Mean	SD	Min	Max
Calories burnt by exercise	Female	118.00	2523.76	145.56	250	3200
	Male	82.00	3141.99	137.66	720	4750

The average calories burnt by exercise of female respondents were 2523.76±145.56 kcal, ranged from 250 kcal to 3200 kcal. The average calories burnt by exercise of male respondents were 3141.99±137.66 kcal, ranged from 720 kcal to 4750 kcal.

Table 4.13: One Way ANOVA analysis calories burnt by exercise per week

	Sum of Squares	df	Mean Square	F	p-value
Between Groups	18490945.61	1	18490945.61	3.19	0.08
Within Groups	1147794828.34	198	5796943.58		
Total	1166285773.96	199			

F-test of the average score of calories burnt by exercise between female and male was 3.19 (p = 0.08). Conclusion the average score of female and male were not significantly difference.

Table 4.14: Age of respondents

		N	Mean	SD	Min	Max
Age	Female	118.00	56.28	11.84	27.13	82.18
	Male	82.00	53.66	12.16	27.78	83.20

The average age of female respondents were 56.28±11.84 years old, ranged from 27.13 years old to 82.18 years old. The average age of male respondents were 53.66±12.16 years old, ranged from 27.78 years old to 83.20 years old.

Table 4.15: One Way ANOVA analysis of age

	Sum of Squares	df	Mean Square	F	p-value
Between Groups	331.91	1	331.91	2.32	0.13
Within Groups	28359.51	198	143.23		
Total	28691.42	199			

F-test of the average score of age between female and male was 2.32 (p = 0.13). Conclusion the average score of female and male were not significantly difference.

Table 4.16: Eating behavior score

		N	Mean	SD	Min	Max
Eating behavior score	Female	118.00	6.46	1.10	3.97	8.56
	Male	82.00	6.13	1.18	3.09	8.31

The average eating behavior score of female respondents were 6.46±1.10 points, ranged from 3.97 points to 8.56 points. The average age of male respondents were 6.13±1.18 points, ranged from 3.09 points to 8.31 points.

Table 4.17: One Way ANOVA analysis of eating behavior score

	Sum of Squares	df	Mean Square	F	p-value
Between Groups	5.14	1	5.14	3.99	0.05
Within Groups	254.61	198	1.29		
Total	259.75	199			

F-test of the average score of eating behavior score between female and male was 3.99 (p = 0.05). Conclusion the average score of female and male were significantly difference.

Conclusion: One way ANOVA confirmed that Blood Pressure, medication compliance, knowledge about hypertension score, age and calories burnt by exercise between female and male patients were not significantly difference (p > 0.05). But eating behavior score between female and male patients were significantly difference (p = 0.05).

For 8-17 hypotheses:

Hypotheses 8-17 had 2 continuous (Ratio scale) variables. The data for these hypotheses were analyzed via Pearson's product moment correlation method. The statistical significance α was set to 0.05. Results were shown in Table 18 to 27.

(8) $\rho_{\text{Age. SeSBP}} = 0$

Table 4.18: Correlations between age and Systolic Blood Pressure

	Systolic Blood Pressure	age
Pearson Correlation	1.00	0.16
p (1-tailed)		***0.02**
N	200	200

Correlation was significant at the 0.05 level (1 tailed)

This study found that there were a positive relationship and significant between age and Systolic Blood Pressure. ($r=+0.16$, $R^2=0.03$, $p = 0.02$).

Conclusion: The older patients were, the higher Systolic Blood Pressure they got.

(9) $\rho_{\text{Calories Burnt by Exercise. SeSBP}} = 0$

Table 4.19: Correlations between calories burnt by exercise and Systolic Blood Pressure

	Systolic Blood Pressure	calories burnt by exercise
Pearson Correlation	1.00	-0.81
p (1-tailed)		**0.00
N	200	200

Correlation was significant at the 0.01 level (1-tailed)

This study found that there were a negative relationship and significant between Systolic Blood Pressure and calories burnt by exercise. (r= -0.81, R^2=0.66, p = 0.00)
Conclusion: The less exercise patients did, the higher Systolic Blood Pressure they got.

(10) $\rho_{\text{Knowledge about hypertension. SeSBP}} = 0$

Table 4.20: Correlations between knowledge about hypertension and Systolic Blood Pressure

	Systolic Blood Pressure	knowledge about hypertension
Pearson Correlation	1.00	-0.03
p (1-tailed)		0.69
N	200	200

Correlation was not significant at the 0.05 level (2-tailed)

This study found that there were a negative weak relationship and not significant between knowledge about hypertension and Systolic Blood Pressure(r= -0.03, R^2=0.00, p = 0.69).
Conclusion: The less knowledge about hypertension patients were, the higher Systolic Blood Pressure they got.

(11) $\rho_{\text{Eating behavior score. SeSBP}} = 0$

Table 4.21: Correlations between eating behavior score and Systolic Blood Pressure

	eating behavior score	Systolic Blood Pressure
Pearson Correlation	1.00	0.59
p (1-tailed)		**0.00
N	200	200

Correlation was significant at the 0.01 level (1-tailed)

This study found that there were a positive relationship and significant between eating behavior score and Systolic Blood Pressure (r= +0.59, R^2=0.035, p = 0.00).
Conclusion: The more eating behavior score patients were, the higher Systolic Blood Pressure they got.

(12) $\rho_{\text{Medication compliance. SeSBP}} = 0$

Table 4.22: Correlations between medication compliance and Systolic Blood Pressure

	medication compliance	Systolic Blood Pressure
Pearson Correlation	1.00	-0.98
p (1-tailed)		**0.00
N	200	200

Correlation was significant at the 0.01 level (1-tailed)

This study found that there were a negative relationship but significant between medication compliance and Systolic Blood Pressure(r= -0.98, R^2=0.96, p = 0.00).
Conclusion: The less medication compliance patients were, the higher Systolic Blood Pressure they got.

(13) $\rho_{\text{Age. SeDBP}} = 0$

Table 4.23: Correlations between age and Diastolic Blood Pressure

	age	Diastolic Blood Pressure
Pearson Correlation	1.00	-0.19

p (1-tailed)		****0.00**
N	200.00	200.00

Correlation was significant at the 0.01 level (1-tailed)

This study found that there were a negative relationship and significant between age and Diastolic Blood Pressure. (r= -0.19, R^2=0.04, p = 0.00)
Conclusion: The younger patients were, the higher Diastolic Blood Pressure they got.

(14) $\rho_{\text{Calories Burntby Exercise. SeDBP}} = 0$

Table 4.24: Correlations between calories burnt by exercise and Diastolic Blood Pressure

	calories burnt by exercise	Diastolic Blood Pressure
Pearson Correlation	1.00	-0.43
p (1-tailed)		****0.00**
N	200.00	200.00

Correlation was significant at the 0.01 level (1-tailed)

This study found that there were a negative relationship but significant between calories burnt by exercise and Diastolic Blood Pressure (r= -0.43, R^2=0.18, p = 0.00)
Conclusion: The less exercise patients were, the higher Diastolic Blood Pressure they got.

(15) $\rho_{\text{Knowledge about hypertension. SeDBP}} = 0$

Table 4.25: Correlations between knowledge about hypertension and Diastolic Blood Pressure

	knowledge about hypertension	Diastolic Blood Pressure
Pearson Correlation	1.00	-0.10
p (1-tailed)		0.15
N	200.00	200.00

Correlation was not significant at the 0.05 level (1-tailed)

This study found that there were a weak negative relationship and not significant between knowledge about hypertension and Diastolic Blood Pressure. (r= -0.10, R^2=0.01, p = 0.15).
Conclusion: The less knowledge about hypertension patients were, the higher Diastolic Blood Pressure they got.

(16) $\rho_{\text{Eating behavior score. SeDBP}} = 0$

Table 4.26: Correlations between eating behavior score and Diastolic Blood Pressure

	eating behavior score	Diastolic Blood Pressure
Pearson Correlation	1.00	0.53
p (1-tailed)		****0.00**
N	200.00	200.00

Correlation was significant at the 0.01 level (1-tailed)

This study found that there were a positive relationship and significant between eating behavior score and Diastolic Blood Pressure. (r= +0.53, R^2=0.28, p = 0.00).
Conclusion: The more eating behavior patients were, the higher Diastolic Blood Pressure they got.

(17) $\rho_{\text{Medication compliance. SeDBP}} = 0$

Table 4.27: Correlations between medication compliance and Diastolic Blood Pressure

	medication compliance	Diastolic Blood Pressure
Pearson Correlation	1.00	-0.60
p (1-tailed)		****0.00**
N	200.00	200.00

Correlation was significant at the 0.01 level (1-tailed)

This study found that there were a negative relationship and significant between medication compliance and Diastolic Blood Pressure. (r= -0.60, R^2=0.36, p = 0.00). Conclusion: The less medication compliance patients were, the higher Diastolic Blood Pressure they got.

Pearson's product moment correlation confirmed that age and eating behavior score were significantly positively correlated with Systolic Blood Pressure (r=+0.16, +0.59 with p=0.02, 0.00 respectively). However, calories burnt by exercise and medication compliance were significantly negatively correlated with Systolic Blood Pressure (r= - 0.81, -0.98 with p=0.00, 0.00 respectively) meaning the younger patients were, the more patients exercised and had more medication compliance the less Systolic Blood Pressure they got. But the more patients ate the more Systolic Blood Pressure they got. Moreover, Pearson's product moment correlation confirmed that age, calories burnt by exercise and medication compliance significantly inversely related with Diastolic Blood Pressure (r= -0.19, -0.43, -0.60 with p=0.00, 0.00, 0.00 respectively) but eating behavior score significantly related with Diastolic Blood Pressure (r=+0.53 with p=0.00) meaning the older patients were, the more patients exercised and more complied the less Diastolic Blood Pressure they got but the more patients ate the more Diastolic Blood Pressure they got.

Hypothesis 18, 19 had 1 continuous (Ratio scale) dependent variable Blood Pressure and 6 independent variables—male (gender), age, eating behavior score, medication compliance, calories burnt by exercise and knowledge about hypertension score—described in this equation. Hierarchical stepwise multiple regression analysis was employed. According to literature review and the conceptual model, 6 variables were divided into 2 groups. Firstly, gender and age were added to the equation (model 1) then followed by calories burnt by exercise, knowledge about hypertension, eating behavior score and medication compliance (model 2). The statistical significance α was set to 0.05. Results were shown in Table 28 to 31.

Ho 18: Model predicted Systolic Blood Pressure

$SeSBP = b_0 + b_1$ male $+ b_2$ age $+ b_3$ calories burnt by exercise $+ b_4$ eating behavior $+ b_5$ medication compliance $+ b_6$ knowledge about hypertension

$Z_{SeSBP} = b1\ Z_{male} + b2\ Z_{age} + b3\ Z_{\text{calories burnt by exercise}} + b4 Z_{\text{eating behavior score}} + b5\ Z_{\text{medication compliance}} + b6\ Z_{\text{knowledge about hypertension}}$

Table 4.28: Correlation matrix of Systolic Blood Pressure

	Systolic Blood Pressure	gender (male)	age	calories burnt by exercise	knowledge about hypertension	medication compliance	eating behavior score
Systolic Blood Pressure	1.00						
gender (male)	-0.11	1.00					
age	*0.16	-0.11	1.00				
calories burnt by exercise	**-0.81	0.11	*-0.13	1.00			
knowledge about hypertension	-0.03	-0.01	0.00	-0.04	1.00		
Medication compliance	**-0.98	0.11	*-0.15	**0.78	0.04	1.00	
eating behavior score	**0.59	-0.14	0.14	-0.90	0.00	-0.19	1.00
Mean	150.24	0.41	55.21	2787.24	6.31	7.41	6.33
SD	18.49	0.49	12.01	141.61	1.57	1.93	1.14

* significant at 0.05 level (1-tailed)

** significant at 0.01 level (1-tailed)

There were 6 independents variables in the equation. The medication compliance had negatively significantly largest correlation with Systolic Blood Pressure (r=**-0.98, R^2=0.96, p=0.00). Calories burnt by exercise had negatively significantly correlation with Systolic Blood Pressure as well. Calories burnt by exercise (r = **-0.81, R^2=0.66, p=0.00). However, eating behavior score and age had positively significantly correlation with Systolic Blood Pressure as well. Eating

behavior score (r=**+0.59, R^2=0.35, p=0.00) and age (r= *+0.16, R^2=0.03, p=0.02) respectively.

Conclusions: 1. The more patients complied to medication, the less Systolic Blood Pressure they got. 2. The more they exercised the less Systolic Blood Pressure they got. 3. The younger they were the less Systolic Blood Pressure they got. On the other hand, the more salty food the patients ate the more Systolic Blood Pressure they got.

Moreover, this study found that medication compliance had positively correlated with calories burnt by exercise, it meant that the more patient complied the more they exercised (r = **+0.78, R^2=0.61, p=0.00).

Calories burnt by exercise correlated with age, it meant that the older patient had more exercised (r = *-0.13, R^2=0.02, p=0.05).

Table 4.29: Coefficients of Systolic Blood Pressure

	Model 1			Model 2				
	b	SE	Beta	b	SE	Beta	T	p-value
Constant	139.02	6.31		161.25	3.46		46.60	**0.00
gender	-3.35	2.64	-0.09	0.06	0.47	0.00	0.12	0.90
age	0.23	0.11	0.15	0.01	0.02	0.01	0.76	0.45
calories burnt by exercise				0.00	0.00	-0.11	-5.34	**0.00
knowledge about hypertension				-0.05	0.15	0.00	-0.37	0.72
medication compliance				-8.54	0.19	-0.90	-44.41	**0.00
eating behavior score				13.27	1.22	0.82	10.88	**0.00
r				0.76				
R^2				0.58				

Dependent Variable: Systolic Blood Pressure

* significant at 0.05 level (1-tailed)

** significant at 0.01 level (1-tailed)

The two steps of hierarchical stepwise multiple regression analysis statistics were used to explore the relationships (predicted) between Systolic Blood Pressure and all six predictors (gender, age, calories burnt by exercise, eating behavior score, medication compliance score, and knowledge about hypertension score).

The directional nature of the hypotheses, one-tailed t-tests were used to assess for significance. It yielded 2 equations of The Systolic Blood Pressure prediction as the followings.

(1) Unstandardized prediction equation

SeSBP = 161.25 – ****8.54 medication compliance score**+****13.27 eating behavior score**+ ****0.00 calories burnt by exercise** + 0.01 age- 0.05 knowledge about hypertension + 0.06 male

* significant at 0.05 level (1-tailed)

** significant at 0.01 level (1-tailed)

Given all others variables constant, when 1. Medication compliance score increased one unit Systolic Blood Pressure would significantly decrease 8.54 mmHg. (p = 0.00) 2. Eating behavior score increased one unit Systolic Blood Pressure would significantly increase 13.27 mmHg. (p = 0.00) 3. Calories burnt by exercise increased one unit Systolic Blood Pressure would significantly increase 0 mmHg. (p = 0.00) 4. Age increased one unit Systolic Blood Pressure would not significantly increase 0.01 mmHg. (p = 0.45) 5. Knowledge about hypertension increased one unit Systolic Blood Pressure would not significantly decrease 0.05 mmHg. (p = 0.72) 6. If samples were female Systolic Blood Pressure would not significantly increase 0.06 mmHg. (p=0.90)

(2) Standardized prediction equation

Z_{SeSBP}= $\mathbf{**-0.90Z_{compliance\ score}}$ +**$\mathbf{0.82Z_{eating\ behavior\ score}}$–** $\mathbf{0.11Z_{calories\ burnt\ by\ exercise}}$+ $0.01Z_{age}$ +$0.00Z_{\text{knowledge about hypetension}}$+$0.00Z_{male}$

* significant at 0.05 level (1-tailed)

** significant at 0.01 level (1-tailed)

Given all others variables constant, when 1.Medication compliance score increased one standard unit Systolic Blood Pressure would significantly decrease 0.90 standard unit (p=0.00) 2. Eating behavior score increased one standard unit Systolic Blood Pressure would significantly increase 0.82 standard unit (p=0.00) 3. Calories burnt by exercise increased one standard unit Systolic Blood Pressure would significantly decrease 0.11 standard unit (p=0.00) 4. Age increased one standard unit Systolic Blood Pressure would not significantly increase 0.01 standard unit (p=0.45) 5. Knowledge about hypertension increased one standard unit Systolic Blood Pressure would not significantly increase 0.00 standard unit (p=0.72) 6. If samples were female Systolic Blood Pressure would not significantly increase 0.00 standard unit (p=0.90).

The influence of the predictors could be evaluated from the standardized prediction equation. The three most significant variables those predicted Systolic Blood Pressure were medication compliance (Beta = -0.90, p=0.00), eating behavior score (Beta = 0.82, p=0.00) and calories burnt by exercise (Beta = -0.11, p=0.00) respectively.

R^2 was equal to 0.58. It meant 58% variance of Systolic Blood Pressure could be explained by all of these six predictors. The variance of these six predictors namely- medication compliance, eating behavior score, calories burnt by exercise, knowledge about hypertension, age and gender could accounted for 58% variance of Systolic Blood Pressure.

Ho 19: Model predicted Diastolic Blood Pressure

$$SeDBP = b_0 + b_1 \text{ male} + b_2 \text{ age} + b_3 \text{ calories burnt by exercise} + b_4 \text{ eating behavior} + b_5 \text{ medication compliance} + b_6 \text{ knowledge about hypertension}$$

$$Z_{SeDBP} = b1\ Z_{male} + b2\ Z_{age} + b3\ Z_{\text{calories burnt by exercise}} + b4 Z_{\text{eating behavior score}} + b5\ Z_{\text{medication compliance}} + b6\ Z_{\text{knowledge about hypertension}}$$

Table 4.30: Correlation matrix of Diastolic Blood Pressure

	Diastolic Blood Pressure	gender (male)	age	calories burnt by exercise	knowledge about hypertension	medication compliance	eating behavior score
Diastolic Blood Pressure	1.00						
gender (male)	0.00	1.00					
age	**-0.19	-0.11	1.00				
calories burnt by exercise	**-0.43	0.11	*-0.13	1.00			
knowledge about hypertension	-0.10	-0.01	0.00	-0.04	1.00		
medication compliance	**-0.60	0.11	*-0.15	**0.78	0.04	1.00	
eating behavior score	**0.53	-0.14	0.14	-0.90	0.00	-0.19	1.00
Mean	89.40	0.41	55.21	2787.24	6.31	7.41	6.33
SD	9.15	0.49	12.01	141.61	1.57	1.93	1.14

* significant at 0.05 level (1-tailed)

** significant at 0.01 level (1-tailed)

There were 6 independents variables in the equation. The medication compliance had negatively significantly largest correlation with Diastolic Blood Pressure (r= **-0.60, R^2=0.36, p=0.00). Calories burnt by exercise and age had negatively significantly correlation with Diastolic Blood Pressure as well. Calories burnt by exercise (r = **-0.43, R^2=0.18, p=0.00) and age(r=**-0.19, R^2=0.04, p=0.00) respectively. However, eating behavior score had positively significantly correlation with Diastolic Blood Pressure as well. Eating behavior score (r=**+0.59, R^2=0.35, p=0.00).

Conclusions: 1. The more patients complied to medication, the less Diastolic Blood Pressure they got. 2. The more they exercised the less Diastolic Blood Pressure

they got. 3. The older they were the less Diastolic Blood Pressure they got. On the other hand, the more salty food the patients ate the more Diastolic Blood Pressure they got.

Moreover, the value from correlation matrix also predicted relationship between calories burnt by exercise and age, medication compliance and age, medication compliance and calories burnt by exercise.

Medication compliance correlated with calories burnt by exercise, it meant that the more patient complied the more they exercised (r = **+0.78, R^2=0.60, p=0.00).

Calories burnt by exercise correlated with age, it meant that the older patient had more exercised (r = *-0.13 R^2=0.02, p=0.05).

Table 4.31: Coefficients of Diastolic Blood Pressure

	Model 1			Model 2				
	b	SE	Beta	b	SE	Beta	T	p-value
Constant	97.93	3.13		92.25	4.83		19.11	**0.00
gender	-0.40	1.31	-0.02	0.56	1.00	0.03	0.56	0.58
age	-0.15	0.05	-0.20	-0.22	0.00	0.08	-5.32	0.37
calories burnt by exercise				0.00	0.04	-0.29	0.90	**0.00
knowledge about hypertension				-0.44	0.31	-0.08	-1.41	0.16
medication compliance				-3.33	0.41	-0.70	-8.19	**0.00
eating behavior score				5.78	1.05	0.72	5.48	**0.00
R				0.74				
R^2				0.55				

Dependent Variable: Diastolic Blood Pressure

* significant at 0.05 level (1-tailed)

** significant at 0.01 level (1-tailed)

The two steps of hierarchical stepwise multiple regression analysis statistics were used to explore the relationships (predicted) between Systolic Blood Pressure and all six predictors (gender, age, calories burnt by exercise, eating behavior score, medication compliance score, and knowledge about hypertension score).

The directional nature of the hypotheses, one-tailed t-tests were used to assess for significance. It yielded 2 equations of The Diastolic Blood Pressure prediction as the followings.

(1) Unstandardized prediction equation

SeDBP = 92.25 +****5.78 eating behavior score**– ****3.33 compliance score+ ****0.00 calories burnt by exercise** - 0.44 knowledge about hypertension -0.22 age + 0.56 male

* significant at 0.05 level (1-tailed)

** significant at 0.01 level (1-tailed)

Given all others variables constant, when 1. Medication compliance score increased one unit Diastolic Blood Pressure would significantly decrease 3.33 mmHg. (p=0.00) 2. Eating behavior score increased one unit Diastolic Blood Pressure would significantly increase 5.78 mmHg. (p=0.00) 3. Calories burnt by exercise increased one unit Diastolic Blood Pressure would significantly increase 0 mmHg. (p=0.00) 4. Age increased one unit Diastolic Blood Pressure would not significantly decrease 0.22 mmHg. (p=0.37) 5. Knowledge about hypertension increased one unit Diastolic Blood Pressure would not significantly decrease 0.44 mmHg. (p=0.16) 6. If samples were female Diastolic Blood Pressure would not significantly increase 0.56 mmHg. (p=0.58).

(2) Standardized prediction equation

Z_{SeDBP} = $**\mathbf{0.72Z_{eating\ behavior\ score}}$ $**\mathbf{-0.70Z_{compliance\ score}}$** $\mathbf{-0.29Z_{calories\ burnt\ by\ exercise}}$ $-0.08Z_{knowledge\ about\ hypertension}$ $+0.08Z_{age}+0.03Z_{male}$

* significant at 0.05 level (1-tailed)

** significant at 0.01 level (1-tailed)

Given all others variables constant, when 1.Medication compliance score increased one standard unit Diastolic Blood Pressure would significantly decrease 0.70 standard unit (p=0.00) 2. Eating behavior score increased one standard unit Diastolic Blood Pressure would significantly increase 0.72 standard unit (p=0.00) 3. Calories burnt by exercise increased one standard unit Diastolic Blood Pressure would significantly decrease 0.29 standard unit (p=0.00) 4. Age increased one standard unit Diastolic Blood Pressure would not significantly increase 0.08 standard unit (p=0.37) 5. Knowledge about hypertension increased one standard unit Diastolic Blood Pressure would not significantly decrease 0.08 standard unit (p=0.16) 6. If samples were female Diastolic Blood Pressure would not significantly increase 0.03 standard unit (p=0.58).

The influence of the predictors could be evaluated from the standardized prediction equation. The three most significant variables those predicted Diastolic Blood Pressure were eating behavior score (Beta = 0.72, p=0.00), medication compliance (Beta = -0.70, p=0.00) and calories burnt by exercise (Beta = -0.29, p=0.00) respectively.

R^2 was equal to 0.55. It meant 55% variance of Diastolic Blood Pressure could be explained by all of these six predictors. The variance of these six predictors namely- medication compliance, eating behavior score, calories burnt by exercise, knowledge about hypertension, age and gender could accounted for 55% variance of Diastolic Blood Pressure.

CHAPTER V
DISCUSSION AND CONCLUSION

In this study, a retrospective research by face to face interviewing followed the questionnaire guideline survey was employed to study the multiple relationships between calories burnt by exercise, medication compliance, eating behavior score, knowledge about hypertension and Blood pressure of 200 hypertensive patients who came to Saraburi hospital during the period of January 1, 2009 to December 31, 2009.

The data were discussed and presented into three sections according to the research questions as the followings:-

When controlling for Hydrochlorothiazide:

1. Did hypertensive patient male and female have different calories burnt by exercise, medication compliance score, eating behavior score, knowledge about hypertension, age and Blood Pressure?

2. Could (calories burnt by exercise, medication compliance score, eating behavior score, knowledge about hypertension and age) individually predicted Blood Pressure in hypertensive patients? In other words were there any significant correlation between (calories burnt by exercise, medication compliance score, eating behavior score, knowledge about hypertension and age) and Blood Pressure? And also relationships between all predictors e.g. calories burnt by exercise, medication compliance score, eating behavior score, knowledge about hypertension and age were explored.

3. What factors significantly and not significantly predicted Blood Pressure in hypertensive patients?

Discussion, conclusion, recommendation, qualifications of this study and future study were also provided.

This study found that most of hypertensive patients were female (118, 59%). The patient averages age were 55.21 ± 12.01 years old. Most 178, 89% of patients were married. The largest subgroup (97, 48.50%) at a particular level of educational attainment had completed grade school and the most of patients (46, 23%) were house maid.

5.1 Assessment of research question

This study inspected the relationship between age, calories burnt by exercise, knowledge about hypertension, eating behavior score, medication compliance score and Blood Pressure. Our study posed three fundamental inquiries (when controlling for drug "Hydrochlorothiazide").

5.1.1 The first question

The first question asked "Did hypertensive patients male and female have different calories burnt by exercise, medication compliance score, eating behavior score, knowledge about hypertension, age and Blood Pressure?". The study found that Blood Pressure, medication compliance score, calories burnt by exercise, knowledge about hypertension and age between male and female were not significantly different ($p > 0.05$). However, eating behavior score between male and female were significantly different ($p = 0.05$). One explanation was the sampling patients were old. The average age was 55.21 ± 12.01 years old therefore gender did not effect the exercise between them.

5.1.2 The second question

The second question asked "Could (age, calories burnt by exercise, medication compliance score, knowledge about hypertension and eating behavior score) individually predict Blood Pressure in hypertensive patients? In other words were there any significant correlation between (age, calories burnt by exercise, medication compliance score, knowledge about hypertension and eating behavior score) and

Blood Pressure?" The study found that eating behavior score and age were significantly positively correlated with Systolic Blood Pressure (r=**+0.59 R^2=0.35, r=*+0.16 R^2=0.03 with p=0.00, 0.02 respectively) meaning the more patients ate the more Systolic Blood Pressure, the older patients were the more Systolic Blood Pressure, inversely related with calories burnt by exercise and medication compliance were significantly negatively correlated with Systolic Blood Pressure (r= **- 0.81 R^2=0.86,r=
-0.98 R^2=0.96 with p=0.00, 0.00 respectively) meaning the more patients exercised the less Systolic Blood Pressure and the more medication compliance the less Systolic Blood Pressure. Moreover age, calories burnt by exercise and medication compliance significantly inversely related with Diastolic Blood Pressure (r= **-0.19 R^2=0.04, r= -0.43 R^2=0.18, r=-**0.60 R^2=0.36 with p=0.00, 0.00, 0.00 respectively) meaning the older patients were the less Diastolic Blood Pressure, the more patients exercised the less Diastolic Blood Pressure and the more patients complied the less Diastolic Blood Pressure. However eating behavior score significantly related with Diastolic Blood Pressure (r=**+0.53 R^2=0.28 with p=0.00) meaning the more patients ate the more Diastolic Blood Pressure.

5.1.3 The third question

The third question asked "What factors significantly predicted Blood Pressure in hypertensive patients?"

For Systolic Blood Pressure

The study found that in the full model of 6 variables, only medication compliance, calories burnt by exercise, eating behavior score and age were the significant predictors of Systolic Blood Pressure (r= **-0.98, R^2=0.96, p=0.00, r = **-0.81, R^2=0.66, p=0.00, r=**+0.59, R^2=0.35, p=0.00, r= *+0.16, R^2=0.03, p=0.02 respectively). However, knowledge about hypertension score and gender were not significantly predictors (r=-0.03, R^2=0.00, p=0.69, r = -0.11, R^2=0.02, p=0.90 respectively). These results supported Anjali U. Pandit (2009), Mingzhi Zhang (2009).

All 6 variables in this model could explain Systolic Blood Pressure for 0.58% (R^2 = 0.58)

For Diastolic Blood Pressure

The study found that in the full model of 6 variables, only medication compliance, calories burnt by exercise, eating behavior score and age were the significant predictors of Diastolic Blood Pressure (r= **-0.60, R^2=0.36, p=0.00, r = -**0.43, R^2=0.18, p=0.00, r=**+0.59, R^2=0.35, p=0.00, r= **-0.19, R^2=0.04, p=0.00 respectively). However, knowledge about hypertension score and gender were not significantly predictors (r=-0.10, R^2=0.01, p=0.15, r = +0.00, R^2=0.00, p=0.58 respectively). These results supported Jen et al., (2009), Laura P. et al.,(2009), Kunihiko et al.,(2009).

The R^2 (coefficient of determination) was the total percent variance of dependent variable (Blood Pressure) could be explained by all of the six dependent variables namely: calories burnt by exercise, medication compliance score, eating behavior score, knowledge about hypertension, age and gender or how good the six predictors were? The R^2 had value range from 0 to 1. The higher R^2 value indicated a better of explanatory power of the model resulted in greater prediction of the dependent variables. In the study got approval medium R^2 (0.58 and 0.55).

The explanations were: Firstly, very dependable conceptual model that was modified form substantial reviewing literatures of the past examinations made the researchers attentively choose only valid predictors and throw away inappropriate variables. The point was specification errors were overcome.

Secondly, qualified scales specifically Sorofman Medical regimen Compliance scale, Eating behavior scale and Haskell Compendium of Physical Activities were carefully selected and employed therefore, less uncertainty of validity and reliability of these scales were identified. For example, Sorofman Medical regimen Compliance scale was more advance by tuning the questions specification for hypertensive patients. Eating behavior scale was extended by adding 5 specific questions about salt diet. It yielded more face and content validity. The additional salt consumption construct (that the old scale for diabetes patients version 2 did not have) produced the larger percent variance of Blood Pressure that could be accounted for by all variables. In addition visual analog ratio scale was replaced the old category ordinal scale of

version 2. Haskell Compendium of Physical Activities, It was worldwide used and referred.

Thirdly, the clinical data such as age, occupation, Blood Pressure in this study were collected from a reliable source—Saraburi computer data base. Furthermore face to face interview was employed to collect data for those sophisticated and sensitive 3 scales consequently the ambiguity and misunderstanding of the questions were wiped out.

5.2 Conclusion and recommendation

In study found that when controlling for drug "Hydrochlorothiazide", Hypertensive patients, Blood Pressure could be significantly predicted by 1. Eating behavior —the more patients salty dietary patients were the higher Blood Pressure they got ($p<0.01$), 2. Medication compliance—meaning the more the patients complied to medications the lower Blood Pressure they got ($p<0.01$), 3. The quantity of calories burnt by exercise—meaning the more they exercise the lower Blood Pressure they got ($p<0.05$). However, surprisingly age inversely correlated to Diastolic Blood Pressure—meaning, the older the patients were the lower Blood Pressure they got. Last but not least, gender was a significant factor to predict Blood Pressure. Male hypertensive patients had significantly higher Blood Pressure than female ($p<0.01$),

In summary, eating behavior, medication compliance, calories burnt by exercise and age were three significantly most influence factors for predicting Blood Pressure. The hypertensive patients should be educated how to eating and comply with hypertension and do more exercise.

5.3 Qualification of this study

5.3.1 Qualification of the medication compliance scale

Regarding questions in medical regimen medication compliance scale; patient might not clearly understand all questions that interviewer asked, the scale needed

more content validity to well specify medication compliance. Moreover, researchers required more capable evidence based technique to identify medical regimen medication compliance for example “pill count”.

5.3.2 Too many scales and too many questions

In this study 56 questions were asked. This might confused and/or make respondents fatigue, time consume and be bored when answer these question then measurement errors occurred.

5.3.3 Qualification of the statistical analysis

This research could be improved by using One Way ANCOVA statistics (for hypotheses 1-7) controlling for (baseline) blood pressure—pretest before treatment with drugs—and age of patients as the two covariates and blocking design by drug. It would yield more reliable and precise results when get rid of these confounders.
For hypotheses 8-17, future research design would minimize error form extraneous variables namely—age, blood pressure before treatment (baseline) by applying partial correlation instead of simple correlation liked this research. We certainly believed that the more powerful statistical techniques were employed the more accurate and reliable outcomes we would achieve unconditionally.

5.4 Future study

According to one skeptic result of the study, as hard as we tried to control extraneous variables, use qualified instrument and scrutinize in all details, age was inversely correlated with diastolic Blood Pressure. This seemed against the rational perception. Therefore, others researchers who want to investigate this topic should be cautioned to identify the truth of this finding. Future study should be done in more hypertensive patients in different hospitals in Thailand to increase external validity and can be generalized to all Thai Hypertensive patients as a whole.

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APPENDICES

APPENDIX A

แบบสอบถามผู้ป่วยโรคความดันโลหิตสูง

<u>ส่วนที่ 1</u> แบบบันทึกข้อมูลส่วนบุคคลของผู้ป่วยโรคความดันโลหิตสูง

โปรดตอบแบบสอบถาม โดยกาเครื่องหมาย ✓ ลงในช่อง O ที่ตรงคำตอบของท่าน

หรือเติมคำตอบลงในช่องว่าง (.....) ที่เว้นให้

1. วันเกิด: วันที่ .....เดือน.....พ.ศ.....เบอร์มือถือ.....

2. เพศ O ชาย O หญิง

3. สถานภาพสมรส O โสด O สมรส /คู่ O หม้าย / หย่า / แยก

4. ระดับการศึกษา

O ไม่ได้เรียนหนังสือ O ประถม O มัธยม

O อนุปริญญา O ปริญญาตรี O ปริญญาโท O อื่นๆ .....

5. อาชีพ

O รับราชการ O รัฐวิสาหกิจ O นักเรียน / นักศึกษา

O ธุรกิจส่วนตัว O พ่อค้า / แม่ค้า O แม่บ้าน

O พนักงานบริษัท O รับจ้าง O เกษตรกรรม

O อื่นๆ.....

6. น้ำหนัก.....กิโลกรัม

7. ส่วนสูง.....เซนติเมตร

8. ระดับความดันโลหิต.....มิลลิเมตรปรอท

<u>ส่วนที่ 2</u> แบบบันทึกพฤติกรรมการรับประทานอาหารของผู้ป่วยโรคความดันโลหิตสูง

1. ท่านรับประทานอาหารเช้า

คำถามของผู้สัมภาษณ์: ท่านรับประทานอาหารเช้าบ่อยแค่ไหน ทุกวัน วันเว้นวัน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

2. ท่านรับประทานอาหารกลางวัน

คำถามของผู้สัมภาษณ์: ท่านรับประทานอาหารกลางวันบ่อยแค่ไหน ทุกวัน วันเว้นวัน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

3. ท่านรับประทานอาหารเย็น

คำถามของผู้สัมภาษณ์: ท่านรับประทานอาหารเย็นบ่อยแค่ไหน ทุกวัน วันเว้นวัน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

4. ท่านมักจะรับประทานหลัง 3 ทุ่ม หรือก่อนนอน

คำถามของผู้สัมภาษณ์: ท่านมักรับประทานอาหารหลัง 3 ทุ่มหรือก่อนนอน บ่อยแค่ไหน ทุกวัน วันเว้นวัน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

5. ปกติท่านรับประทานข้าว 1 จาน

คำถามของผู้สัมภาษณ์: ปกติท่านรับประทานข้าว 1 จานบ่อยแค่ไหน ทุกวัน วันเว้นวัน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

6. ปกติท่านรับประทานข้าว 2 จานขึ้นไป

คำถามของผู้สัมภาษณ์: ปกติท่านรับประทานข้าว 2 จานบ่อยแค่ไหน ทุกวัน วันเว้นวัน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

7. ท่านชอบรับประทานอาหารประเภทของทอด เช่น ปาท่องโก๋ เต้าหู้ทอด

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานอาหารประเภทของทอด เช่น ปาท่องโก๋ เต้าหู้ทอด หรือไม่ ถ้าไม่ แล้วพวกหอยทอด, ผัดไทย, ลูกชิ้นทอดล่ะ ชอบรับประทานหรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือนหรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานของทอด ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

8. ท่านรับประทานอาหารประเภทขนมหวาน เช่น ฝอยทอง ทองหยิบ ขนมเค้ก

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานอาหารประเภทขนมหวาน เช่น ฝอยทอง ทองหยิบ ขนมเค้ก ถ้าไม่ชอบแล้ว โดนัท, สลิ่ม, ทับทิมกรอบ, ไอศครีมล่ะ ชอบรับประทานหรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานของหวาน ขนมหวาน ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

9. ท่านชอบรับประทานไข่เค็มเป็นประจำ

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานไข่เค็มเป็นประจำหรือไม่ ถ้าไม่ชอบแล้ว ผักดองเค็มล่ะชอบรับประทานหรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานของเค็ม ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

10. ท่านรับประทานปลาเค็มเป็นประจำ

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานปลาเค็มเป็นประจำหรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือนหรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานอาหารประเภทปลาเค็ม ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

11. ท่านชอบรับประทานหนังสัตว์, เครื่องในสัตว์ หรือ เนย

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานหนังสัตว์, เครื่องในสัตว์ หรือ เนยเป็นประจำหรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานหนังสัตว์ เครื่องในสัตว์ หรือพวกไขมัน ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

12. ท่านมักรับประทานผลไม้ที่มีรสหวาน เช่น ละมุด ลำไย ทุเรียน ลิ้นจี่

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานผลไม้ที่มีรสหวาน เช่น ละมุด ลำไย ทุเรียน ลิ้นจี่เป็นประจำหรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานผลไม้ที่มีรสหวาน ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

13. ท่านมักชอบรับประทานเพื่อให้หมด ไม่เหลือทิ้งเสียของ

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานเพื่อให้หมด ไม่เหลือทิ้งเสียของเป็นประจำหรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

14. ท่านชอบรับประทานของหวานปิดท้ายหลังรับประทานอาหารคาวเช่น บัวลอย ขนมหม้อแกง

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานของหวานปิดท้ายหลังรับประทานอาหารคาว เช่น บัวลอย ขนมหม้อแกงเป็นประจำหรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

15. ท่านรับประทานน้ำอัดลม น้ำหวาน หรือ ชากาแฟใส่น้ำตาลเป็นประจำ

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานของหวานปิดท้ายหลังรับประทานน้ำอัดลม น้ำหวาน หรือ ชากาแฟใส่น้ำตาลเป็นประจำ หรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

16. ท่านมักจะมีขนมถุง มันฝรั่งกรอบ ติดไว้ที่บ้านเพื่อรับประทานเสมอ

คำถามของผู้สัมภาษณ์: ท่านมักจะมีขนมถุง มันฝรั่งกรอบ ติดไว้ที่บ้านเพื่อรับประทานเสมอหรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

17. ท่านชอบรับประทานอาหารฟาสต์ฟูด เช่น แม็คโดนัล, เคเอฟซี เป็นประจำ

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานอาหารฟาสต์ฟูด เช่น แม็คโดนัล, เคเอฟซี เป็นประจำหรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

18. ท่านชอบดื่มเครื่องดื่มที่มีเบียร์ หรือ ไวน์

คำถามของผู้สัมภาษณ์: ท่านชอบดื่มเครื่องดื่มที่มีเบียร์ หรือ ไวน์ หรือไม่ ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

19. ท่านชอบรับประทานอาหารที่มีคาร์โบเดรตเป็นส่วนประกอบสูง เช่น เส้นก๋วยเตี๋ยว, บะหมี่, ขนมจีน

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานอาหารที่มีคาร์โบเดรตเป็นส่วนประกอบสูง เช่น เส้นก๋วยเตี๋ยว, บะหมี่, ขนมจีน หรือไม่ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานอาหารที่มีคาร์โบเดรตเป็นส่วนประกอบสูง ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

20. ท่านชอบรับประทานผักที่มีคาร์โบไฮเดรตสูง เช่น ฟักทอง แครอท มันเทศ มันฝรั่ง

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานผักที่มีคาร์โบไฮเดรตสูง เช่น ฟักทอง แครอท มันเทศ มันฝรั่ง หรือไม่ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานผักที่มีคาร์โบไฮเดรตสูง ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

21. ท่านชอบรับประทานน้ำพริก

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานน้ำพริกหรือไม่ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานน้ำพริกซึ่งมีรสเค็ม ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

22. อาหารที่ท่านรับประทานมักจะปรุงรสด้วยน้ำปลา หรือ เกลือ เสมอ

คำถามของผู้สัมภาษณ์: ท่านชอบปรุงรสด้วยน้ำปลา หรือ เกลือ หรือไม่ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานน้ำปลา หรือ เกลือ ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

23. ท่านชอบรับประทานบะหมี่สำเร็จรูปพร้อมเครื่องปรุง

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานบะหมี่สำเร็จรูปพร้อมเครื่องปรุง หรือไม่ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานบะหมี่สำเร็จรูปพร้อมเครื่องปรุง ซึ่งมีรสเค็ม ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

24. ท่านชอบเติมซีอิ๊วขาวในอาหารที่ท่านรับประทาน

คำถามของผู้สัมภาษณ์: ท่านชอบเติมซีอิ๊วขาวในอาหารที่ท่านรับประทาน หรือไม่ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานซีอิ๊วขาวซึ่งมีรสเค็ม ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

25. ท่านชอบรับประทานปลาร้า

คำถามของผู้สัมภาษณ์: ท่านชอบรับประทานปลาร้าหรือไม่ทานบ่อยแค่ไหน ทุกวัน ทุกอาทิตย์ ทุกเดือน หรือไม่รับประทานเลย คิดเป็นกี่เปอร์เซ็นต์

(ผู้สัมภาษณ์ต้องการข้อมูลพฤติกรรมการรับประทานปลาร้าซึ่งมีรสเค็ม ดังนั้นจึงต้องซักถามเพื่อให้ได้คำตอบที่ต้องการ)

<u>ส่วนที่ 3</u> แบบบันทึกพฤติกรรมการออกกำลังกายของผู้ป่วยโรคความดันโลหิตสูง

คำชี้แจง โปรดระบุชนิดและความถี่ของการออกกำลังกาย ที่ท่านออกในแต่ระยะเวลา 1 สัปดาห์ (ตอบได้มากกว่า 1 ชนิด)

ท่านออกกำลังกายคือ	ครั้งละกี่นาที	สัปดาห์ละกี่ครั้ง
1.	.....	.....
2.	.....	.....
3.	.....	.....
4.	.....	.....
5.	.....	.....

ลักษณะงานอาชีพที่ท่านทำคือ

.....

ท่านทำงานบ้านอะไรบ้างเช่น ทำสวน ถูบ้าน ซ่อมรั้ว

งานบ้านที่ทำคือ	ครั้งละกี่นาที	สัปดาห์ละกี่ครั้ง
1.	.....	.....

2. ……	……	……
3. ……	……	……
4. ……	……	……
5. ……	……	……

<u>ส่วนที่ 4</u> แบบทดสอบความรู้ของผู้ป่วยเกี่ยวกับโรคความดันโลหิตสูง

คำชี้แจง โปรดเติมคำตอบลงในช่องว่าง (.....) ที่กำหนด

1. ท่านเป็นโรคความดันโลหิตสูงชนิดใด

(....).ปกติ.(<.120/80...มม.ปรอท) (….) สูงกว่าปกติ (120-139/80-89 มม.ปรอท)

(….) ระดับ1 (140-159/90-99มม.ปรอท) (….) ระดับ2 (≥160/100 มม.ปรอท)

2. อาการอย่างหนึ่งของโรคความดันโลหิตสูง คือ ปวดศีรษะ ใช่หรือไม่

.....

3. ผู้ป่วยโรคความดันโลหิตสูงควรรับประทานยาตามแพทย์สั่ง ใช่หรือไม่

.....

4. โรคหัวใจเป็นโรคแทรกซ้อนที่จะเกิดขึ้นกับผู้ป่วยโรคความดันโลหิตสูง ใช่หรือไม่

.....

5. ผู้ป่วยโรคความดันโลหิตสูงไม่ควรรับประทานอาหารที่มีรสเค็มจัด ใช่หรือไม่

.....

6. ผู้ป่วยโรคความดันโลหิตสูงไม่ควรเครียด ใช่หรือไม่

.....

7. ผู้ที่เป็นโรคความดันโลหิตสูงจะมีระดับความดันโลหิตสูงกว่า 139/89 มิลลิเมตรปรอท ใช่หรือไม่

.....

8. ถ้ามีความดันโลหิตสูงเกินไป จะทำให้เส้นเลื่อดในสมองแตกได้ ใช่หรือไม่

.....

9. โรคความดันโลหิตสูงเป็นโรคที่สามารถถ่ายทอดได้ทางพันธุกรรม ใช่หรือไม่

.....

10. ผู้ป่วยโรคความดันโลหิตสูงไม่ควรสูบบุหรี่ ใช่หรือไม่

.....

<u>ส่วนที่ 5</u> บันทึกพฤติกรรมการใช้ยาของผู้ป่วยโรคความดันโลหิตสูง

คำชี้แจง โปรดตอบแบบสอบถาม โดยกาเครื่องหมาย ✓ ลงในช่อง O ที่ตรงคำตอบของท่าน หรือทำเครื่องหมาย × ลงบนบริเวณที่ท่านมีความเห็นตรงมากที่สุด

1. การที่ท่านจะรับประทานยารักษาโรคความดันโลหิตสูงห้ตรงตามแพทย์สั่งเป็นการยากหรือง่ายเท่าใด เป็นกี่เปอร์เซ็นต์

2. เมื่อท่านรับประทานยาในสัปดาห์ที่แล้ว ท่านรับประทานยาถูกต้องตามจำนวนที่แพทย์สั่งกี่เปอร์เซ็นต์

3. เมื่อท่านรับประทานยาในสัปดาห์ที่แล้ว ท่านรับประทานยาตรงตามเวลาที่แพทย์สั่งกี่เปอร์เซ็นต์

APPENDIX B

Code book

The Operationalization of the variables

No.	Variables	Attributes
1.	Male	1 = Male 2 = Female
2.	Marital/committed-cohabitation Status	1 = Single 2 = Married
3.	Level of education	1 = Completed grade school 2= Completed high school 3 = Completed junior high school 4 = Technical school 5 = Bachelor degree
4.	Occupations	1 = Government/retired official 2 = Employee 3 = Agriculture 4 = Merchant 5 = House maid
5.	Eating behavior score	Score 0-10
6.	Hypertension knowledge score	Score 0-10
7.	Medication compliance score	Score 0-100
8.	Age	27.13-83.20
9.	Systolic Blood Pressure	120-228 mmHg
10.	Diastolic Blood Pressure	80-132 mmHg

BIOGRAPHY

Anongnart Siemmai was born in Trang, Thailand, on June 25, 1978. She graduated from Demonstration of Prince of Songkla University in 1997 and received her Bachelor of Science degree in Pharmacy from Chulalongkorn University in March 2002. Anongnart worked in BMA medical college and Vajira hospital from 2004 until now, in the position of pharmacist. She entered the Degree of Master of Science in Social and Administrative Pharmacy Program, Faculty of Pharmaceutical Science at Chulalongkorn University in 2008.