NUTRITIVE VALUES OF LOCAL FOODS AND NUTRITIONAL STATUS IN PEOPLE WITH HYPERTENSION AT DOI TUNG DEVELOPMENT PROJECT AREA

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NUTRITIVE VALUES OF LOCAL FOODS AND NUTRITIONAL STATUS IN PEOPLE WITH HYPERTENSION AT DOI TUNG DEVELOPMENT PROJECT AREA

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ABSTRACT

Hypertension is one of the most important issues that needs to be addressed in the Doi Tung Development Project area, Thailand. Public health reports indicate that there were 380 people with hypertension at Doi Tung Development Project area and the trend is increasing. The purpose of this study was to assess the nutritional status and also to determine the nutritive value of the most commonly consumed indigenous food. Nutritional status was assessed by anthropometric measurement and after 24 hours recall. The nutritive values were calculated by INMUCAL - Nutrients program version WD.2.

The data from a cross sectional study on 229 hypertensive members of ethnic hill tribes was collected between May 2008 and November 2009. There were 139 females and 90 males, whose mean age was 59.41 ± 11.82 years and included ethnic Akha (30.1%), Lahu (29.3%), Tai Yai (20.5%), Haw (11.8%), Tai Lue (. 5.2%) and Lawa (3.1%). The results of this study showed that most of the participants (54.1%) were obese (BMI > 25.0 kg/m^2) and 64.6% had abdominal obesity (89.39 ± 11.79 cm). The average body fat percentage, visceral fat level, systolic and diastolic blood pressure were 32.59 ± 7.08%, 11.21 ± 5.82, 146.16 ± 22.69 mmHg and 85.69 ± 14.49 mmHg, respectively. The dietary intake assessment revealed that the participants consumed 121.47 ± 98.37 g. of cholesterol and 1539.80 ± 987.71 kcal of energy per day. The dietary fiber (10.0 ± 6.55 mg.), potassium (1904.41 ± 803.14 mg.) and calcium (327.38 ± 140.55 mg.) intake was lower, whereas sodium (3186.03 ± 1584.79 mg.) was higher than the DASH recommendation. The most frequently consumed local foods were Chinese cabbage curry, tomato chili paste, flower Chinese cabbage curry, dried fermented soybean chili paste, and Num-Ngyo. The menus that contain high sodium were Num-Ngyo with noodles (2,520.25 mg) and Nile tilapia soup (1,252.25 mg) while the menu with the lowest sodium was dried fermented soybean chili paste (352.12 mg).

This study showed that most of hypertensive subjects were obese and unable to control their blood pressure due to inappropriate food consumption. This finding may help health care providers in planning dietary intervention and counseling for hypertensive members of ethnic hill tribes in order to better control their blood pressure.

KEYWORDS: DOI TUNG DEVELOPMENT PROJECT/ HYPERTENSION/ NUTRITIONAL STATUS/ LOCAL FOODS/ NUTRITIVE VALUE

129 pages

คุณค่าทางโภชนาการของอาหารพื้นบ้านและสภาวะโภชนาการของผู้ที่เป็นโรคความดันโลหิตสูงบนพื้นที่โครงการพัฒนาดอยตุง

NUTRITIVE VALUES OF LOCAL FOODS AND NUTRITIONAL STATUS IN PEOPLE WITH HYPERTENSION AT DOI TUNG DEVELOPMENT PROJECT AREA

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บทคัดย่อ

ในพื้นที่โครงการพัฒนาดอยตุง โรคความดันโลหิตสูงเป็นปัญหา ที่ต้องตระหนักถึงความสำคัญ เนื่องจากจำนวนผู้ที่เป็นโรคความดันโลหิตสูงประมาณ 380 คน และมีแนวโน้มที่จะเพิ่มมากขึ้น ทุกปี การศึกษานี้จึงมีวัตถุประสงค์เพื่อศึกษาหาคุณค่าทางโภชนาการของอาหารพื้นบ้านจากการคำนวณด้วยโปรแกรม INMUCAL และประเมินสภาวะโภชนาการโดยการวัดร่างกาย และซักถามอาหารที่รับประทานย้อนหลัง 24 ชั่วโมงใน ผู้ที่เป็นโรคความดันโลหิตสูง บนพื้นที่โครงการพัฒนาดอยตุง

ผลการศึกษาภาคตัดขวาง ในระหว่างเดือนพฤษภาคม พ.ศ. 2551 ถึง เดือนพฤศจิกายน พ.ศ. 2552 มีผู้เข้าร่วมโครงการฯ ทั้งสิ้นจำนวน 229 คน เป็นเพศหญิง 139 คน และเพศชาย 90 คน อายุเฉลี่ย 59.41 ± 11.82 ปี ประกอบด้วยชนเผ่าอาข่า (30.1%) ลาหู่ (29.3%) ไทใหญ่ (20.5%) จีนฮ่อ (11.8%) ไทลื้อ (5.2%) และลัวะ (3.1%) จากการสำรวจ พบว่า ผู้เข้าร่วมโครงการฯ ส่วนใหญ่ (54.1%) มีภาวะอ้วน และร้อยละ 64.6 มีภาวะอ้วนลงพุง โดยมีค่าเฉลี่ยเปอร์เซ็นต์ไขมันในร่างกาย และระดับไขมันในช่องท้อง เท่ากับ 32.59 ± 7.08 เปอร์เซ็นต์ และ11.21 ± 5.82 ตามลำดับ ระดับความดันโลหิตซีสโตลิก และระดับความดันโลหิตไดแอสทอลิกของโดยเฉลี่ยมีค่าเท่ากับ 146.16 ± 22.69 มิลลิเมตรปรอท และ85.69 ± 14.49 มิลลิเมตรปรอท จากการสอบถามอาหารที่รับประทานย้อนหลัง 24 ชั่วโมง พบว่าผู้เข้าร่วมโครงการฯ บริโภคอาหารพลังงานเฉลี่ย 1,539.80 ± 987.71 กิโลแคลอรี่/วัน โดยมาจากไขมัน 24.58 ± 20.26 กรัม โปรตีน 60.65 ± 27.24 กรัม และ คาร์โบไฮเดรต 263.60 ± 141.85 กรัม คิดเป็นร้อยละ 14.6 16.0 และ69.4 ของพลังงานทั้งหมด ตามลำดับ ที่ผู้เข้าร่วมโครงการฯ บริโภคคอเลสตอรอล (121.47 ± 98.37 กรัม) โซเดียม (3186.03 ± 1584.79 มิลลิกรัม) โพแทสเซียม (1904.41 ± 803.14 มิลลิกรัม) แคลเซียม (327.38 ± 140.55 มิลลิกรัม) และเส้นใย (10.0 ± 6.55 มิลลิกรัม) อาหารที่นิยมรับประทานเป็นประจำ ได้แก่ แกงผักกาด ต้น น้ำพริกมะเขือเทศ แกงผักกาดดอก น้ำพริกถั่วเน่า และข้าวซอยน้ำเงี้ยว เป็นต้น รายการอาหารที่นิยมรับประทานและมีโซเดียมมากที่สุด ได้แก่ ข้าวซอยน้ำเงี้ยว (2,520.25 มิลลิกรัม) และ ต้มปลานิล (1,252.25 มิลลิกรัม) ในขณะที่น้ำพริกถั่วเน่ามีโซเดียมอยู่น้อยที่สุด (352.12 มิลลิกรัม)

ผลการศึกษาพบว่าผู้เข้าร่วมโครงการฯ มีภาวะอ้วน และไม่สามารถควบคุมระดับความดันโลหิตให้อยู่ในเกณฑ์ปกติได้ เสี่ยงต่อการเกิดโรคแทรกซ้อน สาเหตุอาจเนื่องมาจากบริโภคอาหารไม่เหมาะสมกับสภาวะโรค ซึ่งข้อมูลจากการศึกษาในครั้งนี้จะมีประโยชน์แก่หน่วยบริการสุขภาพในการวางแผนการ รักษา และการให้คำปรึกษา ด้านอาหารที่เหมาะสม สำหรับชาวเขาผู้ที่เป็นโรคความดันโลหิตสูง ซึ่งจะช่วยในการควบคุมดูแลตนเองไม่ให้เกิด ความเสี่ยงต่อ โรคแทรกซ้อน เพิ่มคุณภาพชีวิต ให้ผู้ที่เป็นโรคความดันโลหิตสูงอยู่ร่วมกับผู้อื่นได้อย่างปกติ

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CHAPTER I
INTRODUCTION

Background and Rationale

The Doi Tung Development Project was established by Her Royal Highness the Princess Mother (Princess Srinagarindara), late mother of His Majesty King Bhumibol Adulyadej. The Doi Tung Development Project area has total of 27 villages and it is situated in the Thoed Thai sub-district of the Mae Fah Luang district of Chiang Rai province. This project was established on January 16, 1987, to solve the social, economic, and environmental problems of people in Doi Tung in order to increase the living standard of people (1) who living in these areas. People living in these villages consist of many tribal communities; such as, Akha, Lahu, and Tai Yai who have different cultures (2). Cultures playing a very important role in these communities and extremely influence on their food patterns. Therefore each community has their own way of doing things from the type of ingredients used to the method of cooking depending on their cultures, traditions and beliefs. As they have different food patterns, it is important to study nutritive values of foods in order to advise appropriate dietary pattern for hypertension patients.

Currently, non-communication chronic disease (NCD) is the major disease that causes morbidity and mortality among people. Hypertension is one of non-communication chronic disease that has been increasing and estimated 972 million people in the world are suffering from this problem. Incidence rates of hypertension range between 3% and 18%, depending on the age, gender, ethnicity, and body size of the population studied (3). Hypertension is associated with a higher risk of having an abnormally enlarged heart (4). Untreated hypertension leads to many degenerative diseases, including congestive heart failure, end-stage renal disease, and peripheral vascular disease. It is often called a “silent killer” because people with hypertension do not know that they have it until they have fetal stroke or heart attack. (5)

Hypertension is one of the most important issues in public health of Thailand (6). Hypertension is fourth leading cause of death in Thailand and 20% of population aged 35 years and above or 5.14 million people are hypertension, it's found in male more than female. This number is still rising especially in children and adolescent (Thai Hypertension Society) due to urbanization, and increasing prevalence of obesity and physical inactivity. Also in Doi Tung area, public health of The Doi Tung Development Project reported the prevalence of hypertension in Doi Tung's population was around 380 people and have trend to increase (7). Current national guidelines recommend weight control, reduced intake of sodium chloride (salt), reduced alcohol consumption, and possibly increased dietary potassium as nutritional approaches to prevent and treat hypertension (8).

The people of Doi Tung Development Project area are ethnic minorities with no formal education. The most of these people belong to low- income group and have strong cultural influence and haven't knowledge about appropriate to manage their blood pressure. They have strong beliefs and are slow in accepting outside influences. As diets play a crucial role in controlling and preventing of hypertension, advise appropriate dietary pattern for hypertension people by using indigenous foods that available in local area is important for acceptability and improving the quality of the life of hypertension patients

CHAPTER II
OBJECTIVES

Research question

What are the nutritive values of local food and nutritional status among hypertensive patients at Doi Tung Development project area?

General objective

The general objective of the study is to determine the nutritive values of local foods and the nutritional status in people with hypertension at Doi Tung Development Project area.

Specific Objectives

1. To assess the nutrition status by anthropometric and dietary assessment in people with hypertension at Doi Tung Development Project area.
2. To determine indigenous food that most frequently consumed among people with hypertension at Doi Tung Project area.
3. To analyze nutritive values, including energy, fat, cholesterol, sodium, potassium, calcium and dietary fiber of local food consumed among people with hypertension.

Benefit of the Study

The results of this study can be used to recommend the appropriate local foods intake to people with hypertension. This study may help health care provider in planning dietary intervention and counseling for hypertensive hill tribes to better control their blood pressure and prevent risk of complication which can reduce the hospital cost and improve their quality of life.

CHAPTER III
LITERATURE REVIEW

3.1 Hypertension

3.1.1 Definition and classification

Blood pressure is a function of cardiac output multiplied by peripheral resistance (the resistance in the blood vessels to the flow of blood). The diameter of the blood vessel markedly affects blood flow. When the diameter is decreased (as in atherosclerosis) resistance and blood pressure increase. Conversely, when the diameter is increased (as with vasodilator drug therapy), resistance decrease and pressure is lowered (5).

Hypertension or high blood pressure is a medical condition in which the blood pressure is chronically elevated. Hypertension is considered to be present when a person's systolic blood pressure (SBP) is 140 mmHg or higher or diastolic blood pressure (DBP) is 90 mmHg higher or both. Hypertension can be classified as either essential (primary) or secondary. Essential hypertension indicates that no specific medical cause can be found to explain a patient's condition. Secondary hypertension indicates that the high blood pressure is a result of another condition, such as kidney disease or certain tumors.

Table 1 Hypertension classification based on JNC7 (9)

Category	Systolic blood pressure		Diastolic blood pressure
Normal	<120	and	<80
Pre -hypertension	120-139	or	80-89
Stage 1 Hypertension	140-159	or	90-99
Stage 2 Hypertension	≥160	or	≥100

3.1.2 Primary Prevention (10)

The National High Blood Pressure Education Program (NHBPEP) is one of the most successful prevention programs in the twentieth century. Through educational efforts the detection, awareness, and treatment of hypertension have improved over the 35 years since its inception. These changes have contributed to the decline in cardiovascular mortality seen during the same time period.

Primary prevention of hypertension can improve quality of life and costs associated with medical management of hypertension and its complications. A strategy for the population would be to reduce blood pressure in those with prehypertension (above 120/80) but below the cut points for stage 1 hypertension. A downward shift of 3 mmHg in SBP would decrease the mortality from stroke by 8% and from coronary heart disease by 5%. Persons at highest risk should be strongly encouraged to adopt healthier lifestyles.

Changing lifestyle factors has documented efficacy in the primary prevention and control of hypertension. These factors include losing weight if overweight; limiting alcohol intake; adopting a dietary pattern that emphasizes fruits, vegetables, and low-fat dairy products; reducing fat, especially saturated fat, and cholesterol; reducing intake of dietary sodium; increasing physical activity; and stop smoking. In individuals with normal blood pressure, modification of these lifestyle factors has been shown to lover blood pressure and thereby has the potential to prevent hypertension and lower risk of blood pressure-related complications. A substantial body of evidence strongly supports these lifestyle modifications as a means of significantly lowering blood pressure in individuals with hypertension.

3.1.3 Excess Body Weight

There is strongly association between BMI and hypertension among men and women in all race or ethnic groups and in most age-groups. Based on the NHANES III survey (11), the prevalence of high blood pressure in persons with a BMI greater than 30 kg/m^2 is 42% for men and 38% of women, compare with 25% for men and women with a normal BMI (<25 kg/m^2). The risk of developing elevated blood pressure is two to six times higher in over-weight than in normal-weight persons. Risk estimates from population studies suggest that 30% or more of cases of

hypertension can be directly attributed to obesity. Weight gain during adult life is responsible for much of the rise in blood pressure seen with aging.

Some of the physiologic changes proposed to explain the relationship between excess body weight and blood pressure are over activation of the sympathetic nervous and renin-angiotensin systems and elevated levels of inflammatory pathways (12).

Virtually all clinical trials on weight reduction and blood pressure support the efficacy of weight loss on lowering blood pressure. In phase I of the Trial of Hypertension Prevention, normotensive individuals who lost an average of 3.5 kg in an 18-month intervention reduced their SBP and DBP by 5.8 mmHg and 3.2 mmHg, respectively (13). Seven year of treatment cessation, the incidence of hypertension was 18.9% in the weight-loss group and 40.5% in the control group (14).

A meta-analysis of 25 randomized controlled trials, totaling nearly 5000 participants from different ethnic groups showed a blood pressure reduction of 4.4/3.3 mmHg for a 5-kg weight loss by means of energy restriction, increased physical activity, or blood pressure occurred without attainment of desirable body weight in most participants. Larger blood pressure reductions were achieved in participants who lost more weight and who were also taking antihypertension medications (15).

Weight reduction and maintenance of a healthy body weight is a major effort for many persons, especially women. Interventions to prevent weight gain are ideal, particularly before an individual reaches midlife. BMI is recommended as a screening tool in adolescence for future health risk (16). In adults a BMI 25 is the cutoff for obesity, and referral to a registered dietitian (RD) is warranted. When a large percentage of the population is obese and hypertensive, better strategies are needed to prevent excess weight gain and improve compliance with treatment (17).

3.1.4 Dietary Factor

Several dietary patterns have been shown to lower blood pressure. Vegetarian dietary patterns have been associated with lower SBP in observational studies and clinical trials (18). Average SBP reductions of 5 to 6 mmHg have been reported (19). Specifically, the Dietary Approaches to Stop Hypertension (DASH) Diet Study shows that this low-fat dietary pattern (including lean meats and nuts while

emphasizing fruits, vegetables, and nonfat dairy products) decreased SBP an average of 6 to 11 mmHg and DBP by 3 to 6 mmHg (20). The DASH diet is found to be more effective than just adding fruits and vegetables to a low-fat dietary pattern.

The OmniHeart Trial examined the effects of three versions of the DASH diet on blood pressure and serum lipids (21). The diets studied included the original DASH diet, a high-protein version of the DASH diet (25% of energy from protein, about half from plant sources), and a high-unsaturated fat DASH diet (31% of calories from unsaturated, mostly monounsaturated). Although each diet lowered SBP, substituting some of the carbohydrate (approximately 10% of total calories) in the DASH diet with either protein or monounsaturated fat achieved the best reduction in blood pressure and blood cholesterol (22). This could be achieved by some more nuts for some of the fruit, bread, or cereal servings.

Because many hypertensive patients are overweight, hypocaloric versions of DASH diet have also been tested for efficacy in promoting weight loss and blood pressure reduction. The WELL diet study (23) found that, for the same 5-kg weight loss, a hypocaloric DASH diet versus a low-caloric/low-fat diet produced a greater reduction in SBP and DBP.

Although the DASH diet is safe and currently being advocated by JNC7 and the American Heart Association (AHA) for preventing and treating pre-hypertension and hypertension, the diet is high in potassium, phosphorus, and protein, depending on how it is planned. For this reason the DASH diet would not be advisable for individuals with end-stage renal disease.

3.1.5 Excessive Consumption of Sodium Chloride

Evidence from a variety of sources (24) supports lowering blood pressure by reducing dietary sodium. Large population studies have demonstrated a positive association between dietary sodium intake and blood pressure over a wide range of sodium intakes. Intervention studies such as the Phase 2 of the Trials of Hypertension Prevention (TOHP) have shown that sodium reduction with or without weight loss can reduce the incidence of hypertension by 20% (25).

Several meta-analyses of randomized sodium reduction trials have confirmed positive effects of sodium reduction on blood pressure in both normotensive and

hypertensive individuals. A high salt intake has also been implicated in hypertensive target organ disease, including cardiovascular and renal damage. Such data provide the basis for current dietary guidelines for all to limit salt intake to 6 g/day or sodium intake to 2.4 g/day, and for those with hypertension to limit sodium intake to 1.5 g/day (26).

There is heterogeneity in individual responsiveness to sodium. Some persons with hypertension show a greater decrease in their blood pressures in response to reduced sodium intake than others. The term "salt-sensitive hypertension" has been used to identify these individuals. This versus "salt-resistance hypertension", which refers to individuals with hypertension whose blood pressures do not change significantly with lowered salt intakes. Current thinking on salt sensitivity is that the relationship between salt and blood pressure is "not binary". Salt sensitivity has a continuous distribution within diverse populations with individuals having greater or lesser degrees of blood pressure reduction. In general, individuals who are more sensitive to the effect of salt/sodium tend to be individuals who are black, obese, or middle-age and older, or those who have diabetes, chronic kidney disease, or hypertension. Currently there are no practical methods for indentifying the salt-sensitive individual from the salt-resistant individual.

3.1.6 Physical Activity

Less active persons are 30% to 50% more likely to develop hypertension than their active counterparts. Despite the benefits of activity and exercise in reducing disease, many Americans remain inactive. Hispanics (33% men, 40% women), blacks (27% men, 34% women), and whites (18% men, 22% women) all have a high prevalence of secondary lifestyles (27).

Two meta-analyses have demonstrated the beneficial effects of exercise on blood pressure. The first analysis showed that walking reduced blood pressure in adults by an average of 2% (28). Second, in 54 randomized clinical trials, aerobic exercise reduce blood pressure an average of 4 mmHg for SBP and 2 mmHg for DBP in patients with and without high blood pressure, irrespective of body weight change (29). Thus increasing the amount of physical activity of low-to-moderate intensity 30

to 40 minutes most days of the week is an important adjunct to other strategies for the primary prevention of hypertension.

3.1.7 Alcohol Consumption

Five to 7% of the hypertension in the population is the result of alcohol consumption (30). A three drink-per-day amount (a total of 3 oz of alcohol) is the threshold for raising blood pressure and is associated with a 3-mmHg rise in SBP. For preventing high blood pressure, alcohol intake should be less than two drinks per day (24 oz of beer, 10 oz of wine, or 3 oz of 80-proof whisky) in men. In women and lighter-weight men, no more than on drink a day is recommended.

3.1.8 Potassium

In observational studies dietary potassium and blood pressure are inversely related (i.e., higher potassium intake are associated with lower blood pressures). Results from clinical trials on potassium and blood pressure have been loss consistent. However, a meta-analysis of these trials found that high dietary potassium may help prevent and control hypertension. On average a median dose of 2.4 g/day of supplemental potassium reduced SBP and DBP by 4.4 and 2.5 mmHg in hypertensives, and 1.8 and 1 mmHg in normotensives. The effects of potassium were greater in blacks than whites and in those with higher intakes of sodium (31).

Potassium intake has also been related to stroke mortality. In a large population-based cohort, higher potassium intake was associated with a 38% lower risk of stroke. Data from the NHANES III survey suggests that low dietary potassium is associated with an increased risk of stoke. However, more statistically significant effects are found for improved diet, aerobic exercise, alcohol and sodium restriction, and fish oil supplements than for potassium supplements.

The large number of fruit and vegetables recommended in the DASH diet makes it easy to meet dietary potassium recommendation of the JNC 7 and the AHA-approximately 4.7 g/day. In individuals with medical conditions that could impair potassium excretion (e.g., chronic renal failure, diabetes, and congestive heart failure), a potassium intake less than 4.7 g/day would by appropriate to prevent hyperkalemia

3.1.9 Other dietary factors

3.1.9.1 Calcium

Higher dairy calcium versus nondairy calcium had been associated with a lower incidence of stroke among men and women. These findings suggest that the effects of calcium may differ, depending on the food source, or alternatively that other constituents of dairy may bi responsible for the observed associations. Peptides derived from milk proteins, especially fermented milk products, have been shown to function as angiotensin-converting enzymes, thereby lowering blood pressure. At present the JNC 7 report recommends a diet rich supplementation for the observation and management of elevated blood pressure. An intake of dietary calcium to meet the goal of 1000 to 2000 mg daily is recommended (32).

3.1.9.2 Magnesium

Magnesium is potent inhibitor of vascular smooth-muscle contraction and may play a role in blood pressure regulation as a vasodilator. In observational studied dietary magnesium was inversely related to blood pressure. Less consistent findings have been report from randomized clinical trials of magnesium supplementation for blood pressure control (30). The DASH dietary pattern emphasizes foods rich in magnesium, including green leafy vegetables, nuts, and while grain breads and cereals. Overall food sources of magnesium rather than supplemental doses of the nutrient are encouraged to prevent or control hypertension.

3.1.9.3 Lipids

Fewer vegans have hypertension than omnivores, even though their salt intake is not significantly different. The vegan diet tends to be higher in polyunsaturated fatty acids (PUFAs), among other nutrients, and lower in total fat, saturated fatty acids, and cholesterol, PUFAs are precursors of prostaglandins, whose actions affect renal sodium excretion and relax vascular musculature. Thus an effect on blood pressure is plausible.

Both the amount and type of fat have been studied with respect to blood pressure. In several large prospective observation studies and clinical trials, intake of total fat and specific fatty acids had little effect on blood pressure. More

recently, studies have shown that supplementation with large doses of fish oil can give a modest reduction in SBP and DBP, especially in older hypertensive persons. Side effects of supplementation with fish oils are frequent and include belching, gastrointestinal distress, and halitosis. For this reason and the high dose requirement, fish oils are not routinely recommended as a means of lowering blood pressure.

Factors other than dietary fat, such as increased potassium levels, appear to lower blood pressure in vegans. Although dietary lipids do not seem to affect blood pressure, thy strongly affect CVD risk; thus the Therapeutic Lifestyle Change diet is recommended for preventing complications from hypertension and CVD. Although fatty acids may not directly affect blood pressure, an olive oil-enriched diet has been shown to result in a 48% reduction in need for antihypertensive medication. Soy protein is another factor that may contribute to the lowering of blood pressure.

3.1.10 Combination of Risk Factors for Cardiovascular Disease

Hypertension often occurs with other risk factors for CVD. In the NHANES III survey of persons with hypertension also had high blood cholesterol levels (>240 mg/dl). Fifty-five percent of overweight men have hypertension compared with 27% of normal weight men. Researchers have long noted a large than normal clustering of CVD risk factors, including abdominal obesity, high triglyceride levels, low high-density-lipoprotein cholesterol, high blood pressure, and high fasting glucose. The National Cholesterol Education Program (NCEP) recommendations for cholesterol management define the occurrence of three or more of these risk factors as the metabolic syndrome (33).

Recent blood pressure treatment guidelines highlight the importance of evaluating patients for the presence of multiple CVD risk factors, and individualizing lifestyle modification and drug therapies to target coexisting abnormalities. Health problems related to the metabolic syndrome are expected to rise dramatically unless effective population-based health promotion strategies are promoted. Fortunately lifestyle modifications can prevent metabolic syndrome from developing.

3.1.11 Medication

A number of medications either raises blood pressure of interfere with the effectiveness of antihypertensive drugs. These include oral contraceptives, steroids, nonsteroidal anti-inflammatory drugs, nasal decongestants and other cold remedies, appetite suppressants, cyclosporine tricyclic antidepressants, and monoamine-oxidase inhibitors.

3.2 Nutrition Management

3.2.1 Lifestyle Modifications

Lifestyle modifications are definitive therapy for some and adjunctive therapy for all persons with hypertension (30). Several months of compliant lifestyle modifications should be tried before drug therapy is initiated. Even if lifestyle modifications cannot completely correct the blood pressure, they will help increase the efficacy of pharmacologic agents and improve other CVD risk factors. Management of hypertension requires a lifelong commitment.

3.2.2 Weight reduction

Weight loss is an effective means of lowering blood pressure in hypertensive individuals. For each kilogram of weight lost, reductions in SBP and DBP of approximately 1 mmHg are expected (34). Hypertensive patients who weigh more than 115% of ideal body weight should be placed on an individualized weight-reduction program that focuses on both hypocaloric dietary intake and exercise. Practical suggestions for assisting clients in increasing time spent walking or in activities that raise the heart rate, reducing portion sizes for meals and snacks, reducing the size and frequency of caloric-containing drinks, and limiting fat intake.

In the Diet, Exercise, and Weight Loss Intervention study, the goal for energy intake to facilitate weight loss was 25 kcal/kg minus approximately 500 kcal daily to produce 0.4-kg/week (about 1-lb) deficit that would reach a total weight loss of 4.5 kg (35). This modest caloric reduction was associated with a significant lowering of SBP and DBP, and low-density-lipoprotein cholesterol levels. For the same degree of weight loss, hypocaloric diets that include a low-sodium DASH

dietary pattern have produced more significant blood pressure reductions than low-calorie diets emphasizing only low-fat food.

Another benefit of weight loss on blood pressure is the synergetic effect with drug therapy. In subjects who lose weight and were taking one antihypertensive drug, lowering of blood pressure was greater than in those taking the drug alone. Therefore weight loss should be adjunct to drug therapy because it may decrease the dose or number of drugs necessary to control blood pressure.

Once weight is lost, maintenance is critical. Unfortunately relapse and weight gains are common following dieting to lose weight. Some factors associated with effective weight maintenance are exercise, positive self-statements related to weight-reduction efforts, self-monitoring activities (use of a food diary, goal setting, early attention to weight regain), and problem-solving skills in lieu of eating during stressful times.

3.2.3 Changing Dietary Patterns

The DASH diet is used for both preventing and controlling high blood pressure. Successful adoption of this diet requires many behavioral changes: eating twice the average number of daily serving of fruits, vegetables, and dairy products; limiting by one third the usual intake of beef, pork, and ham; eating half the typical amounts of fats, oils, and salad dressings; and eating one quarter the number of snacks and sweets. Lactose-intolerant persons may need to incorporate lactose enzyme or use other strategies to replace milk. Assessing patients' readiness to change and engaging patients in problem solving, decision making, and goal setting are behavioral strategies that may improve adherence.

The high number of fruits and vegetables consumed on the DASH diet is a marked change from typical patterns of Americans. To achieve the 8 to 10 servings, two to three fruits and vegetables should be consumed at each meal. Importantly, because the DASH diet is high in fiber, gradual increased in fruits, vegetables, and whole grain foods should be made over time. Slow change can reduce potential short-term gastrointestinal disturbances associated with a high-fiber diet such as bloating and diarrhea. The DASH pattern has been incorporated into the current AHA nutrition guidelines.

3.2.4 Salt Restriction

Moderate sodium restriction (2300 mg sodium daily or 6 g of salt) is recommended for treatment of hypertension. To achieve nutrient adequacy, an adequate intake (AI) level of sodium has been set at 1.5 g/day. The DASH-Sodium trial showed that people consuming diets of 1.5 g/day of sodium had greater blood pressure benefits than those with higher intakes. Lower-sodium diets were also shown to maintain low blood pressure over time and enhance the efficacy of certain blood pressure-lowering medications. Although it may be advisable for individuals with elevated blood pressure to restrict sodium to AI levels, adherence to diets containing less than 2 g/day of sodium is difficult to achieve.

Because most dietary salt comes from processed foods and eating out, changes in food preparation and processing can help patients reach the sodium goal. Sensory studies show that commercial processing could develop and revise recipes using lower sodium concentrations and reduce added sodium without affecting consumer acceptance. In addition to advice to select minimally processed foods, dietary counseling to lower sodium should include instruction on reading food labels for sodium content, avoidance of discretionary salt in cooking or meal preparation (1 tsp = 2400 mg sodium), and use of alternative flavorings to satisfy individual taste. Because the DASH eating plan is rich in fruits and vegetables, which naturally lower in sodium that many other foods, adopting the DASH diet will enable individuals to consume less salt and sodium.

3.2.5 Other Dietary Modifications

3.2.5.1 Minerals

Consuming a diet rich in potassium has been shown to lower blood pressure and blunt the effects of salt on blood pressure in some individuals. The recommended intake of potassium for adults is 4.7 g/day. Potassium-rich fruits and vegetables include leafy green vegetables, fruits, and root vegetables. Examples of such foods include oranges, beet greens, white beans, spinach, bananas, and sweet potatoes. Although meat, milk, and cereal products contain potassium, the potassium from these sources is not as well-absorbed as that from fruits and vegetables.

Increased intakes of calcium and magnesium may have blood pressure benefits, although there is not enough data at present to support a specific recommendation for increasing levels of intake. Rather, recommendations suggest meeting the AI intake for calcium and the recommended dietary allowance for magnesium from food sources rather than supplements. The DASH diet plan encourages foods that would be good sources of both nutrients, including low-fat dairy products, dark green leafy vegetables, beans, and nuts.

3.2.5.2 Lipids

Current recommendations for lipid composition of the diet are those recommended by the NCEP to help control weight and decrease the risk of CVD.

3.2.5.3 Alcohol

The diet history should contain information about alcohol consumption. As discussed previously, alcohol intake should be limited to no more than 2 drinks daily in men, which is equivalent to 2 oz of 100-proof whisky, 10 oz of wine, or 24 oz of beer. Women or lighter-weight men should consume half this amount.

3.2.6 Exercise

Moderate physical activity, defined as 30 to 45 minutes of brisk walking on most days of the week, in recommended as an adjunct therapy in hypertension. Overweight or obese hypertensive patients should strive for 300 to 500 kcal expended in exercise per day or 1000 to 2000 kcal/week to promote weight loss or weight control. Because exercise is strongly associated with success in weight-reduction and weight-maintenance programs, any increase in activity level should be encouraged. Sixty to 90 minutes of daily moderate intensity physical activity is recommended for individuals trying to maintain a new lower weight after having lost weight.

3.3 Nutritional status

Nutritional status is state of the body in relation to the consumption and utilization of nutrients (36). Nutritional status of a population is a very good indicator of overall health status of a population (37) and has been found to be associated with many different morbidity conditions and in effect mortality (38). The nutritional status of individual or communities can be determined by many ways such as anthropometry assessment, laboratory assessment, dietary assessment and clinical assessment.

3.3.1 Anthropometric Assessment

Anthropometry is measurements of the variation of the physical dimensions and the gross composition of the human body at the different age levels and degree of nutrition (39). The anthropometric measurements are widely used in the assessment of nutritional status, at both the individual and population level. For individuals in low-income countries, anthropometry is useful when there is a chronic imbalance between intakes of protein and energy and proportions of body tissues such as fat, muscle, and total body water. Anthropometric measurements are two types, one group of measurements assesses body size and the other group determines body composition

3.3.1.1 Body Size

The most widely used anthropometric measurement of body size is body weight and height. The body size is particularly useful for providing a measure of overweight and obesity in adult. The weight to height ratio or body mass index (BMI) calculated as weight in the unit of kilogram divided by meter square of height. World Health Organization (WHO) recommends the classification of overweight and obesity in Asian adults (40) as shown in Table 2.

Table 2 Classification Nutritional status by body mass index of Asian adults aged greater than or equal to 20 years for Asian people.

Nutritional status	Body Mass Index (kg/m^2)
Underweight	< 18.50
Normal range	18.5 - 22.9
Overweight	≥ 23
At risk	23 - 24.9
Obese I	25 - 29.9
Obese II	≥ 30

Source: World Health Organization the Asia-Pacific perspective Redefining Obesity and its treatment. February 2000 (40).

3.3.1.2 Body Composition

The body composition are based on 2 compartments consist of body fat and fat free mass. The assessment techniques of body composition can indirectly assess fat and fat free mass while their amount and proportion can be indicated the nutritional status. The study assessed the body composition from the information of waist circumference, skinfold thickness, mid upper arm circumference and mid upper arm muscle circumference.

- Triceps Skinfold Thickness (TSF): The skinfold thickness measurements provide an estimate of size of the subcutaneous fat and total body fat. The triceps skinfold thickness can be indicate the calorie reserves stored in the form of fat and a change of body composition overtime. The level of nutritional status is classified by calculate percent standard TSF. The standard TSF value for male is 12.5 mm and female 16.5 mm. The percentage of standard TSF is calculated by follow this equation, percent standard TSF = (measure TSF/ standard TSF) x 100. The classification of percent standard TSF is shown in Table 3.

Table 3 The criteria for % standard TSF value are classified by Jelliffe (39)

Percentage of standard TSF	Level of nutritional status
> 90% of standard	Normal nutritional status
80-90% of standard	Mild malnutrition
60-79% of standard	Moderate malnutrition
< 60% of standard	Severe malnutrition

- Mid Arm Muscle Circumference (MAMC): Mid-upper-arm muscle area is preferable to MAMC as an index of total body muscle mass. The measurement of mid-upper arm circumference (MUAC) is used for calculated MAMC by follow this equation, MAMC = MUAC - (0.314 × TSF).

The assessment of nutritional status level is presented as percent standard MAMC. The standard MAMC value for male and female is 25.3 cm. and 23.2 cm. The percentage of standard MAMC is calculated by follow this equation, percent standard MAMC = (calculated MAMC/ standard MAMC) x 100. The classification of percent standard MAMC is shown in Table 4.

Table 4 The criteria for % standard MAMC value are classified by Jelliffe (39)

Percentage of standard MAMC	Level of nutritional status
> 90% of standard	Normal nutritional status
80-90% of standard	Mild malnutrition
60-79% of standard	Moderate malnutrition
< 60% of standard	Severe malnutrition

- Waist Circumference: Waist circumference can be used to assess a patient's abdominal fat status. A high proportion of fat stored in the abdomen is an independant relative risk factor for obesity related diseases. The standard for waist circumference of Asian adult was identified based on the cut-off values from World Health Organization show in Table 5.

Table 5 Classification of Waist circumference

Gender	Normal range (cm.)
Male	≤ 90
Female	≤ 80

Source: World Health Organization the Asia-Pacific perspective Redefining Obesity and its treatment. February 2000 (40)

- Body Fat Percentage: Estimation of the body fat using the Bioelectrical Impedance (BI) method which sends an extremely weak electrical current through the body to determine the amount of the fat and skeletal muscle tissue. Omron Body Composition Scale. The classification of body fat percentage is shown in Table 6.

Table 6 Interpretation of percentage body fat results

Gender	**Low**	**Normal**	**High**	**Very High**
Female	5.0 – 19.9 %	20.0 – 29.9 %	30.0 – 34.9 %	35.0 – 50.0 %
Male	5.0 – 9.9 %	10.0 – 19.9 %	20.0 – 24.9 %	25.0 – 50.0 %

Source: the manufactures manual for Omron Kerada Scan (41)

- Visceral Fat Level: Visceral fat or abdominal fat is the excess fat contained inside the peritoneal cavity. National research suggests that visceral fat-deep underlying fat in the abdomen surrounding a person's vital organs-may be a greater predictor of heart disease and diabetes than simple weight or body mass index (BMI) (42). The visceral fat level of subjects is classified as shown in Table 7.

Table 7 Interpretation of visceral fat level results

Visceral Fat Level	Classification
1 - 9	Normal
10 - 14	High
15 - 30	Very High

Source: Omron Healthcare (41)

3.4 Doi Tung Development Project area

3.4.1 Food habit among ethnic groups in Doi Tung Development Project area: (43)

3.5.1.1 Akha or E-kaw: The staple crops grown include rice, millet, sugarcane, chilli, corn, beans, cucumber, cabbage, tea, cotton and banana. The animal husbandry includes pigs, chicken, and favorite meat is black dog's meat but it rarely find. So black dog's meat is used to cook for household or treat guest.

3.5.1.2 Lahu or Muhso: Most agriculture of Lahu ethnic group base on melon, pumpkin, beans, millet, cucumber, banana and pepper. The main animal husbandry includes chicken and pig. Moreover they have Kin-Pee-Mai custom, Lahu call Khao-Ja-laor. Main desert in this custom is the sticky rice mix with sesame which calls Kao-Puk.

3.5.1.3 Chinese hill farmer (Haw) Major staple crops grown of Haw ethnic group comprise corn, rice, and cabbage. The animal husbandry includes pigs, duck, and chicken. Most foods are dry beef, which eat with boiled rice and fermented or dried vegetable and before meal usually drinks tea or alcohol.

3.5.1.4 Tai Yai's occupation consist of farming such as rice, sugarcane, corn, soy, peanut, tomato, orange, banana, lime, mango and papaya and animal husbandry includes horse, cattle, pig and chicken.

3.5.1.5. Lawa has agriculture such as farm grain crops, grow plant crops, animal husbandry includes cattle, pig and chicken.

CHAPTER IV
MATERIALS AND METHODS

4.1 Study Design

This study was a cross-sectional survey (November 2008 – June 2009) on nutritional status and nutritive values of the frequent local foods consumption among hypertensive patients at Doi Tung Development Project area.

4.2 Ethical Consideration

This study was approved by the committee on Human Rights Related to Research Involving Human Volunteers, Mahidol University Thailand. Permission from each participant was obtained after explain the protocol and ensuring confidentiality.

4.3 Selection of Sample

4.3.1 Population and subjects

Participants were people living at Doi Tung Development Project area in Chiang Rai, 29 villages and 6 tribes which are Tai Yai, Ahka, Lahu, Haw, Tai Lue and Lawa.

4.3.1.1 Inclusion criteria:

- Age between 30 to 80 years old.
- Patient with a clinical diagnosis of primary hypertension.
- Taking hypertensive medication.
- Agree to sign inform consent.
- Willing to corporate.

4.3.1.2 Exclusion criteria: Participant who following these criteria was included of this study.

- Diabetes
- Have mental problem.
- Unable to communicate orally.

4.3.2 Sample Size Calculation

The sample size was estimated according to Yamane Formula (44) by assume 95% confidences level and there are total of 373 people who have hypertension in Doi Tung Development Project area.

$$n = \frac{N}{1+N(d^2)}$$

$$= \frac{373}{1+ 373(0.05)^2}$$

$$= 193$$

n = Sample size

N = Hypertensive patients in Doi Tung Development Project area
= 373

d = allowable error
= 0.05

Additional 10% drop out

n = 193 + (0.1x193)
= 213

4.3.2 Sample Selection

The total size of sample group was 213 hypertensive patients living in Doi Tung Development Project area.

The sample was selected by equally divided the number of hypertensive patients of each tribe by using proportionate allocation. Since the number of patients of each tribe is different, hypertensive patients selected were representatives of all hypertensive patients of each tribe.

Table 7 Calculation of sample size for each tribe by using proportionate allocation

Tribes	**N**	**Proportion = N/373**	**n = Proportion × 213**
Ahka	120	0.32	69
Lahu	92	0.25	53
Haw	50	0.13	28
Tai Yai	80	0.22	46
Tai Lue	20	0.05	11
Lawa	11	0.03	6
Total	**373**	**1.00**	**213**

Therefore, the size of sample group was 213 hypertensive patients living in Doi Tung Development Project area. They were randomly selected from 6 tribes, 46 from Tai Yai, 69 from Ahka, 53 from Lahu, 28 from Haw, 11 from Tai Lue and 6 from Lawa.

4.4 Data Collection

4.4.1 General characteristics

General information was obtained by using questionnaire. The questionnaire consisted of 2 parts.

Part 1: Personal information included age, gender, income, education level and occupation

Part 2: Health information included disease status, personal illness, nutritional knowledge and exercise

The data were collected through interview and questionnaires. The interviewer had a good understanding of the objective of this research. Also, the interpreter was used in case of participant could not communicate in Thai language. Before interviewing, interpreter was informed the objective of the research to prevent any mistake from occurring.

The questionnaire was reviewed by experts and corrected. Then it was used on people in Doi Tung Development Project area.

4.4.2 Anthropometric measurements

4.4.2.1 Body Mass Index (BMI): Body mass index (BMI) was calculated from the following formulation.

$$BMI\ (kg/m^2) = \text{body weight (kg)} / \text{height } (m^2)$$

- Body weight was measured by using digital weight scale (Omron HBF-362) with participants wearing light clothing and no shoes. The body weight was recorded to the nearest 0.1 kg.

- Height was measured by using stadiometers in standing position. Participants worn light clothing and no shoes. The height was recorded to the nearest 0.1 cm.

BMI value was interpreted with BMI cut-off level of World Health Organization the Asia-Pacific perspective (40)

4.4.2.2 Waist circumference

Waist circumference was measured by using measuring tape at between iliac bone and last rips in centimeter. However, in case of patients had large waist, waist is measured by circling pass belly button. The waist circumference was recorded to the nearest 0.1 cm. Waist circumference value was interpreted with waist circumference cut-off level of World Health Organization the Asia-Pacific perspective (40)

4.4.2.3 Triceps skinfold measurement

Estimation of body fat by using triceps skinfold thickness measurement was used. The triceps skin fold (TSF) was measured by using caliper at mid-point of back of the upper arm over the triceps muscle, midway between the elbow and the acromion process of the scapula. The arm had to relax with the palm of the hand facing forwards (45). The mean of three measurements was taken and used to compare with TSF standard value (39).

4.4.2.4 Mid-Upper Arm Muscle Circumference (MAMC)

The mid-upper arm circumference (MUAC) was used to calculate Mid Arm Muscle Circumference (MAMC). MUAC was measured from the left arm at mid-point between the tip of the acromion process of the scapula and the olecranon process of the ulna. MAC was recorded and used to calculate with TSF to get MAMC compare with MAMC standard value (39).

4.4.2.4 Percent tissue body fat and visceral fat

The Bioelectrical Impedance Analysis (BIA) machine (HBF-362;OMRON, Tokyo, Japan) was used to measure % tissue body fat and visceral fat. Participants had to off their shoes and remove other devices. Then the information of age, height and sex was put in. Participants were to remove metal jewelry from their right hands and feet and empty their pockets of any large items that are metal, such as beepers, keys, cell phones, change, large pieces of jewelry, etc. Then griped the device handles and hold hand straight out at a 90^{O} angle to your body (46). The BIA machine

calculated body fat and showed the result in percent whether the body fat in the normal, high or low level after the participants stood on it.

4.4.3 Dietary assessment

4.4.3.1 Twenty-four hours dietary recall

The method of 24 hours recall of food consumption was used to assess food intake during the previous 24 hours period or preceding day.

The data was collected by interviewing to get detail including amount, cooking methods and brand names of foods and beverages focusing particularly on foods that were important sources of energy. The data were collected twice a week including week day and weekend day by using a set of measuring cup, spoon and food model was used as memory aids or to assist the respondent in assessing portion size of food item consumed (45).

The information were recorded and calculated using INMUCAL – NUTRIENT program WD.2 version in order to find nutrient consumed per day carbohydrate, protein, fat, cholesterol, sodium, calcium, potassium, and fiber. Energy distribution was calculated.

4.4.4 Nutritive value of the most commonly consumed foods

4.4.4.1 Determine the most frequently consumed foods

Determine indigenous food menus and 5 food groups that most frequently consume in each category (such as soup, fried food, etc.) among local customs of Doi Tung Development Project area by using Food Frequency Questionnaires, close-ended questionnaires, that contain food lists and associated set of frequency-of-use response. Food lists were obtained from previous survey and the frequency-of-use response categories were every day, 5-6 times/week, 1-4 times/week, less than 4 times/month and never.

Categories	Point
Every day	4
5-6 times/week	3
1-4 times/week	2
Less than 4 times/month	1
Never	0

The frequent data were recorded and summarized point in each category in order to find out top 10 of each food menu and top 5 of five food groups.

Food Frequency Questionnaires was validated by experts and corrected before using in this study

4.4.4.2 Determine the most frequently consumed food recipes

The most frequently consumed indigenous food recipe in each category was identified the amount of ingredients by interview the local housewives, who are expert in cooking, 3 participants for each tribe.

Inclusion criteria: who following these criteria were included to do a discussion.

- Local housewife living with hypertensive subject.
- Primary cooking for family.
- Willing to corporate.

Exclusion criteria:

- Have mental problem.
- Unable to communicate orally.

The ingredients that were used more than 50% from each tribes were used to represent the recipes. Nutritive value of carbohydrate, protein, fat, cholesterol, sodium, calcium, potassium, and dietary fiber of each menu and top 5 food groups were analyzed by using INMUCAL computer software program (47).

4.4.5 Blood pressure measurement

Blood pressure was taken by using a digital sphygmomanometer (modal ESP-370: Terumo, Japan). Participants had to sit comfortably and take 3 - 5 minutes to deep breaths and relax. Their elbow resting on a surface, wrap the cuff around the

upper arm until it feels snug. The cuff needed to be positioned about 2 inches above the elbow. The measurements were recorded. If blood pressure was too high or too low, waited for 5 minutes and measured again.

4.5 Data analysis

4.5.1 Dietary analysis

Twenty-four hours recall was analyzed by using INMUCAL - Nutrients program WD.2 versions which was developed by the Biostatistics and Computer division of the Institute of Nutrition, Mahidol University (48). Nutritive value such as carbohydrate, protein, fat, saturated fat, cholesterol, sodium, calcium, magnesium, potassium, and fiber were calculated in mean plus or minus standard deviation.

4.5.2 Statistical analysis

Descriptive statistic was used frequency, mean, standard deviation, and percentage to describe for each category sections in the questionnaires and nutrition status.

Analyses will be performed using statistical analysis Statistical package for social science (SPSS) version 13.0 (SPSS Inc., Chicago, Illinois, USA) and Microsoft Excel 2003

CHAPTER V
RESULTS

The cross-sectional survey study had been done between November 2008 to July 2009. Two hundred twenty-nine subjects with primary hypertension from 6 tribes consist of Akha, Lahu, Tai Yai, Chinese, Tai Lue, and Lawa were enrolled in this study. The nutritional status and nutritive value of the ten most consumption foods among hypertensive patients at Doi Tung Development Project area were investigated.

5.1 Subject characteristics

5.1.1 Socio-demographic characteristics of participants

Socio-demographic characteristics of participants were presented in Table 8. Subjects for this study included 90 males and 139 females. Age was between 30 to 80 years, while mean of age was 59.41 ± 11.82 years. The tribes in this study consist of Akha (30.1%), Lahu (29.3%), Tai Yai (20.5), Haw (11.8%), Tai Lue (5.2%), and Lawa (3.1%). Majority of participant were Buddhist (55.9%) and Christian (35.4%) whereas 8.7% believe in spirit and ancestors. More than 70 percent of them were married (72.5%) and 94.3% were uneducated only 3.6% and 1.7% attended primary school and secondary school. Majority of participants were unemployed (40.2%) whereas the most occupation were in agriculture (33.6%), followed by general labor (10%) and Merchandiser (9.2%). The average size of households was between 1 – 4 people (55%) and 5 – 8 people (41.5%). The income was range from 2,000 to 6,000 baht per month (61.6%). In additional, the average food's expense was 73.14 ± 46.58 baht per day.

Table 8 Socio-demographic characteristics of participants

Characteristics		Frequency (n)	Percent (%)
Gender			
Male		90	39.3
Female		139	60.7
Age			
Mean = 59.41	SD = 11.82	Min = 30	Max = 80
30 – 40 years		8	3.5
41 – 50 years		51	22.3
51 – 60 years		71	31.0
61 – 70 years		47	20.5
71 – 80 years		52	22.7
Tribe			
Akha		69	30.1
Lahu		67	29.3
Tai Yai		47	20.5
Haw		27	11.8
Tai Lue		12	5.2
Lawa		7	3.1
Religion			
Buddhism		128	55.9
Christian		81	35.4
Islam		0	0
Other		20	8.7
Marital Status			
Single		1	0.4
Married		166	72.5
Widower/widow		59	25.8
Divorce		3	1.3

Table 8 Socio-demographic characteristics of participants (cont.)

Characteristics	Frequency (n)	Percent (%)
Education		
Non	216	94.3
Primary school	8	3.6
Secondary school	4	1.7
Diploma/associate's diploma	1	0.4
Bachelor's degree or higher	0	0.0
Occupation		
Agriculture	77	33.6
Merchandiser	21	9.2
General labor	23	10.0
Government official	0	0.0
Employee	9	3.9
Unemployed	92	40.2
Other	7	3.1
Number of Household		
1 – 4 person	126	55
5 – 8 person	95	41.5
9 – 12 person	8	3.5
Household Income (baht/month)		
< 2,000	31	13.5
2,000 – 6,000	141	61.6
6,001 – 10,000	32	14.0
> 10,000	25	10.9
Food's expense (baht/day)		
0 – 50	113	49.3
51 – 100	84	36.7
101 – 150	21	9.8
151 – 200	11	4.8
Mean = 73.14 SD = 46.58	Min = 10	Max = 200

5.1.2 Health information of participants

Health information of participants were represented in Table 9. More than an half of participants were not smokers (60.7%) and non alcohol consumption (85.2%). Ninety-three point nine percent of participant reported that they never lost weight, while only 47.2% exercised regularly by running, walking as approximately 20 minutes a day, 5 times a week. Forty-eight percent of participants had hypertension for less than 1 year while 34.5%, 14.4% and 3.1% had hypertension for 1 – 5 years, 6 – 10 years and more than 10 years respectively. Approximately 35% had family history of hypertension and participants, 19.2% had complication include dyslipidemia (4.8%), cardiovascular (0.9%), renal disease (1.3%) and other disease (12.2%) such as gout, peptic ulcer, etc. Most of participants (63.3%) were treated at health center near their home whereas 24.9%, 4.4%, 3.9%, and 3.5% go to Maejan Hospital, clinic, Maesai Hospital and private hospital respectively. Majority of participant, 87.8% report that they had knowledge of blood pressure control.

Health information of participants according to ethnic groups showed that approximately 90% of Tai Yai, Haw and Tai Lue were not smoking while more than half of Ahka and Lahu were smoking. Most of participant, except Lawa (42.9% of Lawa) were not drinking alcohol. Majority of each tribe never reduced their weight and more than half of Tai Yai, Haw, Tai Lue and Lawa exercised regularly while 59.4% and 71.6% of Akha and Lahu never exercised. More than 50% of each tribe had family history of hypertension especially in Haw (77.8%). Most of Ahka (78.3%) and Lahu (65.7%) had hypertension for < 1 year while Tai Yai (57.4%), Haw (55.6%) and Tai Lue (83.4%) had hypertension for 1 – 5 years but Lawa (57.2%) had for 6 – 10 years. Among six hill tribes, Tai Lue and Lawa did not have hypertension complication while 5.8%, 4.5%, 6.4% and 22.2% of Akha, Lahu, Tai Yai and Haw respectively had hypertension complication. The main five tribes including Akha (66.7%), Lahu (71.7%), Tai Yai (51.1%), Haw (66.7%) and Lawa (57.1%) treated at health center whereas Tai Lue treated at Maejan hoapital and Huai Num Khun health center equally. Most of subjects in each tribe had received knowledge of blood pressure control from health care provider in the area.

Table 9 Health information characteristics of participants according to ethnic groups

Characteristics	Total N = 229	Akha N = 69	Lahu N = 67	Tai Yai N = 47	Haw N = 27	Tai Lue N = 12	Lawa N = 7
Current Smoking, n (%)							
Non-smoke	139 (60.7)	25 (36.2)	29 (43.3)	46 (97.9)	24 (88.9)	11 (91.7)	4 (57.1)
Smoke	90 (39.3)	44 (63.8)	38 (56.7)	1 (2.1)	3 (11.1)	1 (8.3)	3 (42.9)
Alcohol Drinking, n (%)							
Non-drink	195 (85.2)	61 (88.4)	65 (97.0)	34 (72.3)	21 (77.8)	11 (91.7)	3 (42.9)
Drink	34 (14.9)	8 (11.6)	2 (3.0)	13 (27.7)	6 (22.2)	1 (8.3)	4 (57.1)
Sometime	*29 (85.3)*	*6 (75.0)*	*2 (100.0)*	*12 (92.3)*	*5 (83.3)*	*1 (100)*	*3 (75.0)*
Regularly	*5 (14.7)*	*2 (25.0)*	*0 (0.0)*	*1 (7.7)*	*1 (16.7)*	*0 (0.0)*	*1 (25.0)*
Reduce weight, n (%)							
Never	215 (93.9)	66 (95.6)	66 (98.5)	42 (89.4)	24 (88.9)	12 (100)	5 (71.4)
Reduce weight	14 (6.1)	3 (4.4)	1 (1.5)	5 (10.6)	3 (11.1)	0 (0.0)	2 (28.6)
Exercise, n (%), X ± SD							
Never	121 (52.8)	41 (59.4)	48 (71.6)	21 (44.7)	4 (14.8)	5 (41.7)	2 (28.6)
Exercise	108 (47.2)	28 (40.6)	19 (28.3)	26 (55.3)	23 (85.2)	7 (58.3)	5 (71.4)
Average time/day	19.89±10.19	18.93±916	17.00±8.23	17.96±10.40	26.30±11.20	18.57±8.52	19.00±10.84
Average day/week	4.93±2.43	3.18±2.55	5.78±2.15	5.59±2.19	5.96±1.22	2.86±2.11	6.00±2.24

Table 9 Health information characteristics of participants according to ethnic groups (cont.)

Characteristics	Total N = 229	Akha N = 69	Lahu N = 67	Tai Yai N = 47	Haw N = 27	Tai Lue N = 12	Lawa N = 7
Family history, n (%)							
No	150 (65.5)	46 (66.7)	39 (58.2)	32 (68.1)	21 (77.8)	7 (58.3)	4 (57.1)
Yes	79 (34.5)	23 (33.3)	27 (41.8)	15 (31.9)	6 (22.2)	5 (41.7)	3 (42.9)
Hypertension duration, n (%)							
<1 year	110 (48.0)	54 (78.3)	44 (65.7)	7 (14.9)	3 (11.1)	1 (8.3)	1 (14.2)
1-5 years	79 (34.5)	13 (18.9)	12 (17.9)	27 (57.4)	15 (55.6)	10 (83.4)	2 (28.6)
6-10 years	33 (14.4)	1 (1.4)	9 (13.4)	12 (25.5)	6 (22.2)	1 (8.3)	4 (57.2)
>10 years	7 (3.1)	1 (1.4)	2 (3.0)	1 (2.1)	3 (11.1)	0 (0.0)	0 (0.0)
Complication, n (%)							
No	185 (80.8)	55 (79.7)	55 (82.1)	38 (80.8)	21 (77.8)	9 (75.0)	7 (100.0)
Yes	44 (19.2)	4 (5.8)	3 (4.5)	3 (6.4)	6 (22.2)	0 (0.0)	0 (0.0)
Dyslipidemia	*11 (4.8)*	*1 (25.0)*	*2 (66.7)*	*3 (100.0)*	*5 (83.3)*	*0 (0.0)*	*0 (0.0)*
Cardiovascular	*2 (0.9)*	*2 (50.0)*	*0 (0.0)*	*0 (0.0)*	*1 (16.7)*	*0 (0.0)*	*0 (0.0)*
Renal disease	*3 (1.3)*	*1 (25.0)*	*1 (33.3)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0))*
Unknown	28 (12.2)	10 (14.5)	9 (13.4)	6 (12.8)	0 (0.0)	3 (25.0)	0 (0.0)

Table 9 Health information characteristics of participants according to ethnic groups (cont.)

Characteristics	Total N = 229	Akha N = 69	Lahu N = 67	Tai Yai N = 47	Haw N = 27	Tai Lue N = 12	Lawa N = 7
Place of hypertension treatment, n (%)							
Maejan hospital	57 (24.9)	22 (31.9)	7 (10.4)	18 (38.3)	3 (11.1)	5 (41.7)	2 (28.6)
Maesai hospital	9 (3.9)	0 (0.0)	9 (13.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Private hospital	8 (3.5)	1 (1.4)	3 (4.5)	1 (2.1)	2 (7.4)	0 (0.0)	1 (14.3)
Health center	145(63.3)	46 (66.7)	48 (71.7)	24 (51.1)	18 (66.7)	5 (41.7)	4 (57.1)
Doi Tung health center	*60 (41.4)*	*37 (80.4)*	*22 (45.8)*	*1 (4.2)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*
Huai Num Khun health center	*54 (37.2)*	*2 (4.4)*	*2 (4.2)*	*23 (95.8)*	*18 (100.0)*	*5 (100.0)*	*4 (100.0)*
Pa Yang health center	*18 (12.4)*	*6 (13.0)*	*12 (25.0)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*
Pha Mee health center	*2 (.1.4)*	*0 (0.0)*	*2 (4.2)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*
Pha Hee health center	*11 (7.6)*	*1 (2.2)*	*10 (20.8)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*
Clinic	10 (4.4)	0 (0.0)	0 (0.0)	4 (8.5)	4 (14.8)	2 (16.6)	0 (0.0)
Received blood pressure control information, n (%)							
No	25 (10.9)	3 (4.3)	3 (4.5)	5 (10.6)	10 (37.0)	3 (25.0)	1 (14.3)
Yes	204 (89.1)	66 (95.7)	64 (95.5)	42 (89.4)	17 (63.0)	9 (75.0)	6 (85.7)

5.1.3 Blood Pressure

The average systolic and diastolic blood pressure of all subjects was 146.16 ± 22.69 and 85.69 ± 14.49 mmHg while mean of systolic and diastolic blood pressure were 146.31 ± 22.02 and 89.70 ± 14.98 mmHg in male and 134.50 ± 22.79 and 83.12 ± 13.62 mmHg in female. The mean of blood pressure in each tribe, which consisted of Akha, Lahu, Tai Yai, Haw, Tai Lue and Lawa were 129.19 ± 17.77, 142.65 ± 20.25, 147.81 ± 23.39, 151.37 ± 17.39, 159.83 ± 30.87 and 161.71 ± 23.71 mmHg respectively. The highest mean of systolic blood pressure level was Lawa followed by Tai Lue, Haw, Tai Yai, Lahu and Akha. The data of blood pressure levels were given in Table 10.

Table 10 Mean and standard deviation of blood pressure level according to gender and ethnic groups

	Number	**Systolic BP (Mean ± SD)**	**Diastolic BP (Mean ± SD)**
Total	229	146.16 ± 22.69	85.69 ± 14.49
Male	90	146.31 ± 22.02	89.70 ± 14.98
Female	139	134.50 ± 22.79	83.12 ± 13.62
Tribes			
Akha	69	129.19 ± 17.77	80.88 ± 12.40
Lahu	67	142.65 ± 20.25	86.08 ± 13.49
Tai Yai	47	147.81 ± 23.39	89.13 ± 15.77
Haw	27	151.37 ± 17.39	84.33 ± 13.91
Tai Lue	12	159.83 ± 30.87	92.00 ± 18.22
Lawa	7	161.71 ± 23.71	100.71 ± 12.95

Approximately 47% of participants can achieve blood pressure goal (systolic or diastolic less than 140 mmHg or 90 mmHg) including 31 males (34.4% of all male) and 76 females (54.6% of all female). Akha tribe had highest number (72.5%) of hypertensive patients that can achieve blood pressure goal followed by Tai Yai (44.7%) and Lahu (40.3%) whereas more than 80% of Haw unable to control their systolic and diastolic blood pressure level. The data of number and percentage of participants that can achieve blood pressure goal was shown in Table 11.

Table 11 Number and percentage of participants that can achieve blood pressure goal

	Number	**Number (%)**	
		Blood pressure under control*	**Blood pressure uncontrolled**
Total	229	107 (46.7)	122 (53.3)
Male	90	31 (34.4)	59 (65.6)
Female	139	76 (54.6)	63 (45.3)
Tribes			
Akha	69	50 (72.5)	19 (27.5)
Lahu	67	27 (40.3)	19 (27.5)
Tai Yai	47	21 (44.7)	26 (55.3)
Haw	27	5 (18.5)	22 (81.5)
Tai Lue	12	3 (25.0)	9 (75.0)
Lawa	7	1 (14.3)	6 (85.7)

* Blood pressure goal according to JNC 7 (9)

5.2 Nutrition Status

5.2.1 Anthropometry Assessment

The anthropometric measurements of participants were shown in Table 12 - 13. The result of this study showed that more than 70% of subjects had BMI over than normal range (BMI < 23 kg/ m^2) by 16.2%, 38.4% and 15.7% were classified as overweight, obese class I and obese class II respectively while mean of BMI was 25.68 ± 4.77 kg/m^2. Also in waist circumference, approximately 70% of participants had waist circumference over than cut off of World Health Organization classification (normal range of male ≤ 90 cm. and female ≤ 80 cm.) while mean of waist circumference was 89.39 ± 11.79 cm. That mean most of participant (64.6%) were central obesity including 41 male (45.6% of male) and 107 female (76.9% of female).

Mid-arm circumference and triceps skinfold (TSF) were compared with standard value and the result showed 50.7% of all participants had triceps skinfold over than standard value, including 32 male (35.6% of male) and 84 female (60.4% of female). Most of subjects (78.2%) had mid arm muscle circumference (MAMC) over than standard value, including 65 male (72.0% of male) and 114 female (81.7 of female). The mean of MAMC and TSF were 16.93 ± 8.57 cm. and 26.57 ± 3.23 mm. While mean of body fat percentage and visceral fat level were 32.59 ± 7.08 % and 11.21 ± 5.82. Most of participant (68.1%) had body fat percentage at very high level whereas 45.5% of all had visceral fat at normal level.

Nutrition status according to ethnic groups showed most five of ethnic groups including Akha (34.8%), Lahu (34.3%), Tai Yai (42.5%), Haw (51.9%) and Tai Lue (41.7%) were classified as class I obesity whereas 57.1% of Lawa were class II obesity. More than half of each tribe had waist circumference higher than cutoff value. Majority of Akha (53.6%), Lahu (71.7%), Tai Yai (70.0%), Haw (85.2%), Tai Lue (83.3%) especially in Lawa (100%) had body fat percentage higher than normal level. While percent standard mid arm muscle circumference and percent standard triceps skinfold were classified as normal nutrition status.

Table 12 Mean and standard deviation of anthropometric data according to gender and ethnic groups

	N	BMI (kg/m^2)	waist circumference (cm)	TSF (mm)	MAMC (cm)	% body fat (%)	Visceral fat level
Total	229	25.68 ± 4.77	89.39 ± 11.79	16.93 ± 8.57	26.57 ± 3.23	32.59 ± 7.08	11.21 ± 5.82
Male	90	24.94 ± 3.97	88.79 ± 10.43	12.21 ± 6.01	26.84 ± 2.99	27.08 ± 5.07	12.51 ± 5.40
Female	139	26.16 ± 5.18	89.77 ± 12.62	19.99 ± 8.61	26.40 ± 3.37	36.16 ± 5.79	10.36 ± 5.94
Tribes							
Akha	69	25.18 ± 4.30	89.17 ± 10.61	15.37 ± 7.96	26.83 ± 3.47	31.62 ± 6.57	10.61 ± 5.95
Lahu	67	25.16 ± 4.71	88.25 ± 11.81	16.97 ± 9.59	26.74 ± 3.25	31.75 ± 7.23	12.04 ± 6.65
Tai Yai	47	25.17 ± 4.37	87.25 ± 11.51	17.56 ± 7.93	25.74 ± 3.25	33.06 ± 6.96	9.79 ± 4.48
Haw	27	27.52 ± 5.60	92.13 ± 13.25	17.65 ± 7.99	26.25 ± 2.52	34.93 ± 7.16	11.63 ± 5.00
Tai Lue	12	27.07 ± 5.08	93.37 ± 13.77	16.51 ± 7.89	26.58 ± 2.87	32.57 ± 9.06	10.75 ± 4.05
Lawa	7	29.42 ± 6.24	99.33 ± 10.77	25.60 ± 8.15	28.45 ± 2.54	38.20 ± 3.54	17.71 ± 5.38

Table 13 Number and percentage of anthropometric data according to gender and ethnic groups**, N** (%)

Variable	Total			Akha	Lahu	Tai Yai	Haw	Tai Lue	Lawa
	Total	Male	Female						
BMI (kg/m^2)									
Underweight	11 (4.8)	4 (4.4)	7 (5.0)	3 (4.3)	3 (4.5)	4 (8.5)	1 (3.7)	0 (0)	0 (0)
Normal weight	57 (24.9)	26 (28.9)	31 (22.3)	18 (26.1)	18 (26.9)	11 (23.4)	4 (14.8)	5 (41.7)	1 (14.3)
Overweight	37 (16.2)	17 (18.9)	20 (14.4)	14 (20.3)	10 (14.9)	7 (14.9)	5 (18.5)	1 (8.3)	0 (0)
Obese I	88 (38.4)	33 (36.7)	55 (39.6)	24 (34.8)	23 (34.3)	20 (42.5)	14 (51.9)	5 (41.7)	2 (28.6)
Obese II	36 (15.7)	10 (11.1)	26 (18.7)	10 (14.5)	13 (19.4)	5 (10.7)	3 (1.1)	1 (8.3)	4 (57.1)
Waist circumference (cm)									
Normal	81(35.4)	49 (54.4)	32 (23.0)	25 (36.2)	23 (34.3)	19 (40.4)	9 (33.3)	4 (33.3)	1 (14.3)
Central obesity	148 (64.6)	41(45.6)	107(76.9)	44 (63.8)	44 (65.7)	28 (59.6)	18 (66.7)	8 (66.7)	6 (85.7)
Triceps skinfold* (mm)									
≤ standard value	113 (49.3)	58 (64.4)	55 (39.6)	38 (55.1)	35 (52.2)	24 (51.1)	10 (37.0)	5 (41.7)	1 (14.3)
> standard value	116 (50.7)	32 (35.6)	84 (60.4)	31 (44.9)	32 (47.8)	23 (48.9)	17 (63.0)	7 (58.3)	6 (85.7)

* Standard TSF value are classified by Jelliffe (39)

Table 13 Number and percentage of anthropometric data according to gender and ethnic groups**, N** (%) (cont.)

Variable	Total			Akha	Lahu	Tai Yai	Haw	Tai Lue	Lawa
	Total	Male	Female						
Mid Arm Muscle Circumference (cm)									
≤ standard value	50 (21.8)	25 (28.0)	25(18.3)	13 (18.8)	13 (19.4)	16 (34.0)	10 (37.0)	2 (20.0)	3 (42.9)
> standard value	179 (78.2)	65 (72.0)	114 (81.7)	56 (81.2)	54 (80.6)	31 (66.0)	17 (63.0)	10 (80.0)	4 (57.1)
Percentage of body fat (%)									
Low	3 (1.3)	0 (0)	3 (2.2)	2 (2.9)	0 (0)	1 (2.9)	0 (0)	0 (0)	0 (0)
Average	23 (10.0)	10 (11.1)	13 (9.4)	6 (8.7)	10 (19.9)	4 (8.5)	1 (3.7)	2 (16.7)	0 (0)
High	47 (20.5)	13 (14.4)	34 (24.5)	24 (34.8)	9 (13.4)	11 (23.4)	3 (11.1)	0 (0)	0 (0)
Very high	156 (68.1)	67 (74.4)	89 (64.0)	37 (53.6)	48 (71.7)	31 (70.0)	23 (85.2)	10 (83.3)	7 (100)
Visceral fat level									
Normal (0 - 9)	104 (45.4)	31 (34.4)	73 (52.5)	43 (48.3)	22 (47.8)	24 (51.1)	10 (35.7)	5 (41.7)	0 (0)
High level (10 - 15)	83 (36.2)	37 (41.1)	46 (33.1)	26 (29.2)	15 (32.6)	20 (42.6)	13 (46.4)	6 (50.0)	3 (42.9)
Very high level (>15)	42 (18.3)	22 (24.4)	20 (14.4)	20 (22.5)	9 (19.6)	3 (6.4)	5 (17.9)	1 (8.3)	4 (57.1)

* Standard MAMC value are classified by Jelliffe (39)

5.2.2 Dietary Assessment

The data of dietary intake per day according to gender and ethnic groups were given in Table 14. The daily dietary and nutrient intakes of 229 of hypertensive patient at Doi Tung Development Project area obtained from 24 hours recall twice time. The average energy intake for all participants was 1,539.80 ± 987.71 kcal per day and 69.4% of energy came from carbohydrate, 16.0% from protein and 14.6% from fat. While the mean of energy intake of males and females were 1,792.80 ± 994.95 and 1,369.90 ± 942.00 kcal per day. The mean nutrient intake of cholesterol, sodium, potassium, calcium and dietary fiber were 121.47 ± 98.37 g., 3,186.03 ± 1,584.79 mg, 1,904.41 ± 803.14 mg, 327.38 ± 140.55 mg and 10.0 ± 6.55 mg respectively.

Ethnic group which had highest energy intake per day was Lawa (1641.50 ± 395.56 kcal) and followed by Tai Yai (1,629.75 ± 997.47 kcal), Akha (1,591.12 ± 948.60 kcal), Haw (1,586.03 ±1085.35 kcal), Lahu (1,433.37 ± 642.17 kcal) and Tai Lue (1,323.33 ± 498.16 kcal) respectively. More than 60% of energy in each tribe came from carbohydrate. Ethnic group which had highest nutrient intake of cholesterol, sodium, and dietary fiber were Akha (138.84 ± 118.37 g), Lahu (3,879.14 ± 1,966.74 mg), and Tai lue (16.19 ± 14.77 mg) respectively while Haw had highest intake of potassium (2,551.09 ± 926.43 mg) and calcium (450.25 ± 287.82 mg). Whereas ethnic group which had lowest nutrient intake of cholesterol and dietary fiber was Lawa, sodium and potassium was Tai Lue. Lahu had lowest intake of calcium.

The result of nutrient intake according to tribe showed most of participants in each tribe consumed low fat (< 15% of total energy) and cholesterol intake also consumed in low amount. More than 50% of participants in each ethnic groups consumed dietary sodium higher than DASH diet recommendation (< 2,300 mg per day) while potassium, calcium and dietary fiber were consumed lower than DASH diet recommendation. The data of nutrient intake compare to recommendation were given in Table 15.

Table 14 Mean and standard deviation of dietary intake per day according to gender and ethnic groups

	Energy (kcal/day)	Energy Distribution			Grams Per Day		
		Protein	Fat	Carbohydrate	Protein	Fat	Carbohydrate
Total	1539.80 ± 987.71	16.0	14.6	69.4	60.65 ± 27.24	24.58 ± 20.26	263.60±141.85
Male	1792.80 ± 994.95	17.2	14.8	68.0	74.18 ± 28.31	28.47 ± 22.82	293.26±157.59
Female	1369.90 ± 942.00	15.0	14.3	70.7	51.57 ± 25.74	21.98 ± 17.95	243.68±126.97
Tribes							
Akha	1591.12 ± 948.60	17.8	13.9	68.3	68.7 ± 40.82	23.79 ± 18.84	263.46±129.01
Lahu	1433.37 ± 642.17	14.7	15.0	70.3	54.90 ± 28.69	25.01 ± 18.60	263.46±129.01
Tai Yai	1629.75 ± 997.47	16.5	12.7	70.8	64.19 ± 87.51	22.07 ± 17.80	276.27±181.54
Haw	1586.03 ±1085.35	15.8	19.7	64.5	64.08 ± 53.91	35.45 ± 30.69	261.16±181.48
Tai Lue	1323.33 ± 498.16	13.7	9.4	76.9	46.07 ± 25.27	14.13 ± 7.97	258.88±106.15
Lawa	1641.50 ± 395.56	8.9	17.7	73.4	24.16 ± 4.91	21.22 ± 17.74	198.37±72.17

Table 14 Mean and standard deviation of dietary intake per day according to gender and ethnic groups (cont.)

	Mean ± Standard Deviation				
	Cholesterol (g)	**Sodium (mg)**	**Potassium (mg)**	**Calcium (mg)**	**Dietary fiber (mg)**
Total (n)	121.47 ± 98.37	3186.03 ± 1584.79	1904.41 ± 803.14	327.38 ± 140.55	10.0 ± 6.55
Male	142.14 ± 107.05	3471.28 ± 1773.62	2159.69 ± 718.47	361.70 ± 149.11	10.95 ± 6.79
Female	107.60 ± 89.84	2994.46 ± 1419.04	1732.98 ± 854.37	304.33 ± 132.71	9.40 ± 4.60
Tribes					
Akha	138.84 ± 118.37	2868.26 ± 1419.24	1960.93 ± 952.69	293.85 ± 116.76	9.23 ± 5.68
Lahu	115.04 ± 75.55	3879.14 ± 1966.74	1766.03 ± 856.41	279.95 ± 192.60	9.15 ± 6.16
Tai Yai	120.62 ± 99.85	2922.80 ± 1246.83	1798.52 ± 821.51	370.38 ± 178.61	9.53 ± 5.73
Haw	113.54 ± 98.59	3002.15 ± 1503.95	2551.09 ± 926.43	450.25 ± 287.82	12.75 ± 9.50
Tai lue	97.81 ± 71.15	2705.21 ± 532.01	1510.73 ± 422.72	366.07 ± 300.57	16.19 ± 14.77
Lawa	88.82 ± 73.85	2985.13 ± 305.77	1563.26 ± 280.17	282.94 ± 113.61	8.17 ± 1.81

Table 15 Number and percentage of nutrient intake compare to recommendation, N (%)

Nutrient	Total			Akha	Lahu	Tai Yai	Haw	Tai Lue	Lawa
	Total	Male	Female						
Total Fat									
Lower than recommend (fat < 15% of energy)	141 (61.6)	54 (60)	87 (62.6)	42 (60.9)	41 (61.2)	30 (63.8)	14 (51.9)	9 (75.0)	5 (71.4)
On recommend (15 - 30% of energy)	71 (31)	29 (32.2)	42 (30.2)	22 (31.9)	21 (31.3)	16 (34.0)	8 (29.6)	3 (25.0)	1 (14.3)
Higher than recommend (> 30% of energy)	17 (7.4)	7 (7.8)	10 (7.2)	5 (7.2)	5 (7.5)	1 (2.1)	5 (18.5)	0 (0.0)	1 (14.3)
Cholesterol*									
On recommend (≤ 200 mg/day)	186 (81.2)	64 (71.1)	122 (87.8)	53 (76.8)	56 (83.6)	39 (83.0)	22 (81.5)	10 (83.3)	6 (85.7)
Higher than recommend	43 (18.8)	26 (28.9)	17 (12.2)	16 (23.2)	11 (16.4)	8 (17.0)	5 (18.5)	2 (16.7)	1 (14.3)
Sodium**									
On recommend (< 2300 mg/day)	73 (31.9)	24 (26.4)	49 (35.3)	29 (42.0)	15 (22.4)	16 (34.0)	10 (37.0)	3 (25.0)	0 (0.0)
Higher than recommend	156 (68.1)	66 (73.3)	90 (64.7)	40 (58)	52 (77.6)	31 (66.0)	17 (63.0)	9 (75.0)	7 (100.0)

* National Cholesterol Education Program (NCEP) recommendation, **Dietary Approach Stop Hypertension recommendation

Table 15 Number and percentage of nutrient intake compare to recommendation, N (%) (cont.)

Nutrient	Total			Akha	Lahu	Tai Yai	Haw	Tai Lue	Lawa
	Total	Male	Female						
Potassium**									
Lower than recommend	222 (96.9)	85 (94.4)	137 (98.6)	68 (98.6)	66 (98.5)	46 (97.9)	23 (85.2)	12 (100.0)	7 (100.0)
On recommend (≥ 4,700 mg/day)	7 (3.1)	5 (5.6)	2 (1.4)	1 (1.4)	1 (1.5)	1 (2.1)	4 (14.8)	0 (0.0)	0 (0.0)
Calcium**									
Lower than recommend	225 (98.3)	89 (98.9)	136 (97.8)	68 (98.6)	67 (100.0)	46 (97.9)	25 (92.6)	12 (100.0)	7 (100.0)
On recommend (1,000 – 2,000 mg/day)	4 (1.7)	1 (1.1)	3 (2.2)	1 (1.4)	0 (0.0)	1 (2.1)	2 (7.4)	0 (0.0)	0 (0.0)
Dietary Fiber**									
Lower than recommend	216 (94.3)	84 (93.3)	132 (95.0)	66 (95.7)	63 (94.0)	46 (97.9)	24 (88.9)	10 (83.3)	7 (100.0)
On recommend (25 – 30 g/day)	10 (4.4)	4 (4.4)	6 (4.3)	3 (4.3)	4 (6.0)	1 (2.1)	1 (3.7)	1 (8.3)	0 (0.0)
Higher than recommend	3 (1.3)	2 (2.2)	1 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	2 (7.4)	1 (8.3)	0 (0.0)

**Dietary Approach Stop Hypertension recommendation

5.3 Food Consumption, Most Frequently Consumed Foods and Nutritive Value.

5.3.1 Food Consumption

The result according to interview found that there were 50.2% of participants usually bought food for household by themselves whereas 21.8% were their wife or husband. More than half of total participant usually bought the ingredient, including vegetable, meat and seasoning from nearest market of their house such as Huai Num Khun market, Huai Krai market, etc. While there were 86.0% of total subjects usually cooked soup or curry followed by chili paste (9.2%), stir fry (4.4%) and grill or roast (0.4%). Approximately 90% of participants never added salt or fish sauce before they eating only 9.6% added salt or fish sauce less than 1 teaspoon before eating. Fifty-one point nine percent of participants usually bought vegetable for 1-4 times per week as well as meat (75.9%) whereas 93.9% of total subjects bought seasoning less than 4 times per month. Approximately 50% of participants seldom bought delicatessen, including instant noodle, bakery crispy desert canned food and fast food and there were 25.8% never bought ones.

More than half of each ethnic group usually bought vegetable, meat and seasoning from market except Luhu there were 49.3% of Lahu got vegetable by planting and 46.2% bought meat from peddle car. Most of six tribes bought vegetable and meat 1-4 times/week but Tai Yai, Haw and Tai Lue usually bought vegetable everyday. Most of each ethnic group was usually consumed food by boiled method and never added salt or fish sauce before them eating especially Haw hill tribe. The data of food consumption according to ethnic groups were shown in Table 16.

Table 16 Information of Food consumption according to ethnic groups

	Total N = 229	**Akha** N = 69	**Lahu** N = 67	**Tai Yai** N = 47	**Haw** N = 27	**Tai Lue** N = 12	**Lawa** N = 7
Food purchaser							
Subjects	115 (50.2)	40 (58.0)	24 (35.8)	26 (55.3)	17 (63.0)	4 (33.3)	4 (57.1)
Wife/Husband	50 (21.8)	11 (16.0)	16 (23.9)	12 (25.5)	5 (18.5)	3 (25.0)	3 (42.9)
Descendants	33 (14.4)	6 (8.6)	14 (20.9)	7 (14.9)	2 (7.4)	4 (33.3)	0 (0.0)
Other	31 (13.5)	12 (17.4)	13 (19.4)	2 (4.3)	3 (11.1)	1 (8.4)	0 (0.0)
Food Source							
Vegetable							
Planting	63 (27.5)	25 (36.2)	33 (49.3)	3 (6.4)	1 (3.7)	0 (0.0)	1 (14.3)
Peddle car	27 (11.8)	16 (23.2)	11 (16.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Market	138 (60.3)	27 (39.1)	23 (34.3)	44 (93.6)	26 (96.3)	12 (100.0)	6 (85.7)
Other	1 (0.4)	1 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Table 16 Information of Food consumption according to ethnic groups (cont)

	Total N = 229	**Akha** N = 69	**Lahu** N = 67	**Tai Yai** N = 47	**Haw** N = 27	**Tai Lue** N = 12	**Lawa** N = 7
Food Source							
Meat							
Husbandry/hunt	6 (2.6)	1 (1.4)	4 (6.0)	0 (0.0)	1 (3.7)	0 (0.0)	0 (0.0)
Peddle car	59 (25.8)	28 (40.6)	31 (46.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Market	163 (71.2)	39 (56.6)	32 (47.8)	47 (100.0)	26 (96.3)	12 (100.0)	7 (100.0)
Other	1 (0.4)	1 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Seasoning							
Store	46 (20.1)	2 (2.9)	10 (14.9)	18 (38.3)	9 (33.3)	5 (41.7)	2 (28.6)
Peddle car	51 (22.3)	22 (31.9)	28 (41.8)	1 (2.1)	0 (0.0)	0 (0.0)	0 (0.0)
Market	121 (52.8)	44 (63.8)	29 (43.3)	22 (46.8)	16 (59.3)	7 (58.3)	3 (42.8)
Other	11 (4.8)	1 (1.4)	0 (0.0)	6 (12.8)	2 (7.4)	0 (0.0)	2 (28.6)

Table 16 Information of Food consumption according to ethnic groups (cont.)

	Total N = 229	**Akha** N = 69	**Lahu** N = 67	**Tai Yai** N = 47	**Haw** N = 27	**Tai Lue** N = 12	**Lawa** N = 7
Cooking Method							
Soup and curry	197 (86.0)	61 (88.4)	58 (86.6)	38 (80.9)	25 (92.6)	11 (91.7)	4 (57.1)
Chili paste	21 (9.2)	6 (8.7)	5 (7.5)	6 (12.8)	1 (3.7)	1 (8.3)	2 (28.6)
Stir fry	10 (4.4)	2 (2.9)	4 (5.9)	2 (4.2)	1 (3.7)	0 (0.0)	1 (14.3)
Grill/roast	1 (0.4)	0 (0.0)	0 (0.0)	1 (2.1)	0 (0.0)	0 (0.0)	0 (0.0)
Adding salt/fish source							
No	207 (90.4)	63 (91.3)	65 (97.0)	43 (91.5)	27 (100.0)	7 (58.3)	2 (28.6)
Yes	22 (9.6)	6 (8.7)	2 (3.0)	4 (8.5)	0 (0.0)	5 (41.7)	5 (71.4)
> 1 teaspoon	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
≤ 1 teaspoon	22 (100.0)	6 (100.0)	2 (100.0)	4 (100.0)	0 (0.0)	5 (100.0)	5 (100.0)

Table 16 Information of Food consumption according to ethnic groups (cont.)

Food groups	Total N = 229	Akha N = 69	Lahu N = 67	Tai Yai N = 47	Haw N = 27	Tai Lue N = 12	Lawa N = 7
Vegetable							
Everyday	78 (34.1)	15 (21.7)	5 (7.5)	27 (57.4)	21 (77.8)	8 (66.7)	2 (28.6)
Frequently (5-6 times/week)	6 (2.6)	1 (1.5)	0 (0.0)	4 (8.5)	0 (0.0)	1 (8.3)	0 (0.0)
Sometimes (1-4 times/week)	119 (51.9)	42 (60.9)	47 (70.1)	16 (34.1)	6 (22.2)	3 (25.0)	5 (71.4)
Seldom (< 4 times/month)	15 (6.6)	7 (10.1)	8 (11.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Never	11 (4.8)	4 (5.8)	7 (10.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Meat							
Everyday	29 (12.7)	11 (15.9)	1 (1.5)	9 (19.2)	3 (11.1)	3 (25.0)	2 (28.6)
Frequently (5-6 times/week)	13 (5.7)	2 (2.9)	0 (0.0)	8 (17.0)	2 (7.4)	1 (8.3)	0 (0.0)
Sometimes (1-4 times/week)	174 (75.9)	55 (79.7)	58 (86.6)	30 (63.8)	18 (66.7)	8 (66.7)	5 (71.4)
Seldom (< 4 times/month)	10 (4.4)	1 (1.5)	7 (10.4)	0 (0.0)	2 (7.4)	0 (0.0)	0 (0.0)
Never	3 (1.3)	0 (0.0)	1 (1.5)	0 (0.0)	2 (7.4)	0 (0.0)	0 (0.0)

Table 16 Information of Food consumption according to ethnic groups (cont.)

Food groups	Total N = 229	Akha N = 69	Lahu N = 67	Tai Yai N = 47	Haw N = 27	Tai Lue N = 12	Lawa N = 7
Seasoning							
Everyday	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Frequently (5-6 times/week)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Sometimes (1-4 times/week)	13 (5.6)	3 (4.3)	1 (1.5)	2 (4.3)	5 (18.5)	1 (8.3)	1 (14.3)
Seldom (< 4 times/month)	215 (93.9)	66 (95.7)	65 (97.0)	45 (95.7)	22 (81.5)	11 (91.7)	6 (85.7)
Never	1 (0.4)	0 (0.0)	1 (1.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Delicatessen							
Everyday	1 (0.4)	0 (0.0)	1 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Frequently (5-6 times/week)	3 (1.3)	0 (0.0)	2 (3.0)	1 (2.1)	0 (0.0)	0 (0.0)	0 (0.0)
Sometimes (1-4 times/week)	52 (22.7)	17 (24.6)	16 (23.9)	13 (27.7)	1 (3.7)	2 (16.7)	3 (42.9)
Seldom (< 4 times/month)	114 (49.8)	34 (49.3)	30 (44.8)	23 (48.9)	18 (66.7)	6 (50.0)	3 (42.9)
Never	59 (25.8)	18 (26.1)	18 (26.9)	10 (21.3)	8 (29.6)	4 (33.3)	1 (14.2)

5.3.2 Most Frequently Consumed Foods

The frequency and points of the most commonly consumed food in each food groups among hypertensive patients at Doi Tung Development Project area were shown in Table 17. The most frequently consumed in starch group was rice (768 points) followed by sticky rice (235 points), big size of rice noodle (209 points), waxy corn (209 points) and mungbean noodle (200 points). While most frequently consumed of vegetable were tomato (472 points), flower Chinese cabbage (447 points), Chinese cabbage (414 points), Cucumber (328 points), and white Chinese cabbage (304 points) respectively. Top 5 fruits of most frequently consumed were orange (426 points), banana (356 points), ripe papaya (267 points), ripe mango (255 points) and unripe mango (248 points). Whereas pork (651 points), poultry (278 points) and Nile tilapia fish (270 points) were top 3 of source of meat while hen egg389, deep fried pork skin (Kap-Moo) 210 pork ball (186 points) and salted duck egg (186 points) were top 3 of meat products that most of participant frequently consumed. In milk group, soybean milk (218 points) was the most commonly consumed followed by soybean milk (UHT) (130 points) and drinking yogurt (80 points). Participants usually used soybean oil (422 points) followed by palm oil (291 points) and peanut (262 points) in fat and oil food group. Participants also always used salt (763 points), Monosodium glutamate (632 points), and Soybean sauce (259 points) respectively. Top 5 of deserts among hypertensive patients were bread (118 points), crispy rice cracker (Khao-Tan) (109 points), Pa-tong-ko (92 points), Ka-nom-tien (68 points) and glutinous rice steamed with bean and coconut (Khao-Tom-Mat) (56 points) respectively.

The top 10 of frequently consumed local menus were Chinese cabbage curry (469 points), tomato chili paste **(**442 points**),** Flower Chinese cabbage curry (440 points), Dried fermented soybean chili paste (328 points), Num-Ngyo with noodle (318 points),white Chinese cabbage soup (207 points),Green chili Dip, Northern style (199 points), Fried pork (178 points), Nile tilapia soup (171 points) and Fried Nile tilapia (169 points) respectively. The frequency and points of the most commonly consumed local food menus was shown in Table 18.

Table 17 Frequency and points of the most commonly consumed food groups

Food Item	Point of frequency (points)					Total
	Everyday (4)	Frequently 5-6 time/week (3)	Sometimes 1-4 time/week (2)	Seldom <4 time /month (1)	Never (0)	
Starches						
Rice	728	9	20	11	0	768
Sticky rice	148	12	34	59	0	235
Rice noodle, big size	0	0	118	91	0	209
Waxy corn	0	15	90	104	0	209
Mungbean noodle	0	0	94	106	0	200
Fermented noodle	0	0	78	105	0	183
Rice noodle, small size	0	0	88	92	0	180
Potato	0	6	70	86	0	162
Sweet potato	0	6	44	78	0	128
Corn	0	0	28	70	0	98
Vegetables						
Tomato	88	147	212	25	0	472
Flower chinese cabbage	28	126	274	19	0	447
Chinese cabbage	4	87	294	29	0	414
Cucumber	0	24	228	76	0	328
White Chinese cabbage	0	27	196	81	0	304
Garden pea, leave	4	18	202	75	0	299
Green yard long bean	0	9	212	75	0	296
Green Chinese cabbage	4	21	174	92	0	291
Cabbage	0	21	166	88	0	275
Chinese variety gourd	0	6	148	106	0	260
Acacia pennata	0	12	164	83	0	259

Table 17 Frequency and points of the most commonly consumed food groups (cont.)

Food Item	Point of frequency (points)					Total
	Everyday (4)	Frequently 5-6 time/week (3)	Sometimes 1-4 time/week (2)	Seldom <4 time /month (1)	Never (0)	
Fruits						
Orange	68	111	204	43	0	426
Banana	40	66	184	66	0	356
Ripe papaya	16	12	136	103	0	267
Ripe mango	0	21	128	106	0	255
Unripe mango	4	18	134	92	0	248
Tamarind	8	15	62	146	0	231
Water melon	0	6	84	123	0	213
Jujube	0	6	74	121	0	201
Mangosteen	0	12	72	116	0	200
Red apple	0	12	64	122	0	198
Meats						
Pork	376	177	94	4	0	651
Poultry	8	27	148	95	0	278
Nile Tilapia fish	0	12	180	78	0	270
Catfish	0	6	98	84	0	188
Snakehead fish	0	0	54	88	0	142
Prawn	0	0	36	104	0	140
Small fresh water fish	0	3	90	43	0	136
Brandt's rice crab	0	0	14	112	0	126
Beef	0	0	26	99	0	125
Pond snail	0	0	14	107	0	121

Table 17 Frequency and points of the most commonly consumed food groups (cont.)

Food Item	Point of frequency (points)					Total
	Everyday (4)	Frequently 5-6 time/week (3)	Sometimes 1-4 time/week (2)	Seldom <4 time /month (1)	Never (0)	
Other Animal products						
Hen egg	16	60	274	39	0	389
Deep fried pork skin	0	6	88	116	0	210
Salted duck egg	0	15	104	67	0	186
Pork ball	4	6	62	114	0	186
Deep fried buffalo skin	0	3	76	103	0	182
Steamed short bodied mackerel	0	0	84	86	0	170
Salted mackerel	0	0	68	68	0	136
Pork sausage, northern style	0	0	42	90	0	132
Egg tofu	0	3	60	68	0	131
Fermented pork sausage	0	0	32	92	0	124
Milk						
Soybean milk	44	21	72	81	0	218
Soybean milk (UHT)	16	9	48	57	0	130
Yogurt, drinking	0	0	38	42	0	80
Ovaltine	12	3	18	44	0	77
Milo	8	3	10	24	0	45

Table 17 Frequency and points of the most commonly consumed food groups (cont.)

Food Item	Point of frequency (points)					Total
	Everyday (4)	Frequently 5-6 time/week (3)	Sometimes 1-4 time/week (2)	Seldom <4 time /month (1)	Never (0)	
Fat and Oil						
Soybean oil	284	81	46	11	0	422
Palm oil	184	63	34	10	0	291
Peanut	4	27	116	115	0	262
White-sesame	4		34	66	0	104
Lard oil	40	15	16	11	0	82
Seasoning						
Salt	760	0	0	3	0	763
Monosodium glutamate	624	0	2	6	0	632
Soybean sauce	136	27	58	38	0	259
Fish sauce	100	21	60	27	0	208
Ros-dee (soup instant)	76	18	52	21	0	167
Desserts						
Bread	8	6	40	64	0	118
Crispy rice cracker	0	0	14	95	0	109
Pa-tong-ko	0	3	16	73	0	92
Ka-nom-tien	0	0	2	66	0	68
Glutinous rice steamed with bean and coconut	0	0	2	54	0	56

Table 18 The frequency and points of the most commonly consumed local food menus

Food Item	Point of frequency (points)					Total
	Everyday (4 point)	Frequently 5-6 time /week (3 point)	Sometimes 1-4 time /week (2 point)	Seldom < 4 time /month (1 point)	Never (0 point)	
Soup and curry						
Chinese cabbage curry (แกงผักกาดต้น)	40	300	112	17	0	469
Tomato chili paste (น้ำพริกมะเขือเทศ)	20	213	190	19	0	442
Flower Chinese cabbage curry (แกงผักกาดดอก)	8	201	184	47	0	440
Dried fermented soybean chili paste (น้ำพริกถั่วเน่า)	0	189	108	31	0	328
Num-Ngyo with noodle (ข้าวซอยน้ำเงี้ยว)	0	177	92	49	0	318
White Chinese cabbage soup (แกงจืดผักกาดขาว)	0	108	84	15	0	207
Green chili Dip, Northern style (น้ำพริกหนุ่ม)	0	96	84	19	0	199
Fried pork (หมูทอด)	0	90	68	20	0	178
Nile tilapia soup (ต้มปลานิล)	0	69	70	32	0	171
Fried Nile tilapia (ปลานิลทอด)	0	57	74	38	0	169

5.3.3 Nutritive Values of Most Frequently Consumed Foods

The nutritive values of top 5 in each food groups per 1 exchange were shown in Table 19. In starch group, there was rice noodle (108.55 kcal) that has highest energy followed by waxy corn (108.5 kcal). While flower Chinese cabbage gives high calcium potassium and dietary fiber among vegetable group. In fruit group, orange has high calcium and potassium while ripe papaya also gives high potassium. Food item in meat group that has highest cholesterol per 1 serving is snakehead fish (44.7 g) followed by catfish (41.7 g) and poultry (36.9 g).

In animal product group, deep fried pork skin has highest energy (185.70 kcal) and salted duck egg and steamed short bodied mackerel have high sodium. Soybean milk has sodium (120 mg) higher than another food items in top 5 milk group whereas Milo has highest potassium (250 mg). A comparison of seasoning commonly used in hypertensive household was found that Ros-dee has highest sodium (1,640 mg) per 1 teaspoon followed by salt (2,000 mg), Monosodium glutamate (492 mg), soybean sauce (483 mg) and Fish sauce (400 mg).

Top 10 of most frequently consumed food menus were Chinese cabbage curry, tomato chilli paste, flower Chinese cabbage curry, dried fermented soybean chili paste and Num-Ngyo with noodle. Chinese cabbage curry per person have 129.99 kcal of energy, 7.80 g of fat, 23.50 g of cholesterol, 843.35 mg of sodium, 276.01 mg of potassium, 77.97 of calcium and 1.48 mg of dietary fiber. While tomato chili paste per person have 15.63 kcal of energy, 0.15 g of fat, 380.04 mg of sodium, 109.41 mg of potassium, 7.95 of calcium and 0.93 mg of dietary fiber. The nutritive values of flower Chinese cabbage curry was 129.59 kcal of energy, 7.91 g of fat, 23.50 g of cholesterol, 894.85 mg of sodium, 140.13 mg of potassium, 26.11 of calcium and 0.21 mg of dietary fiber. The nutritive values of top 10 of commonly consumed local menus were shown in Table 21. The food menu that contained highest sodium was Num-Ngyo with noodle (2,520.25 mg.) followed by Nile tilapia soup (1,252.25 mg.), flower Chinese cabbage curry (894.85 mg.), Chinese cabbage curry (843.35 mg.) and white Chinese cabbage soup (764.32 mg.). The nutritive values of most commonly consumed food menus per 1 person were shown in Table 20.

Table 19 The nutritive values of most commonly consumed in each food groups exchange (49)

Food Items	Weight (g)	Energy (kcal)	Fat (g)	Cholesterol (g)	Sodium (mg)	Potassium (mg)	Calcium (mg)	Dietary fiber (mg)
Starches								
1. Rice (general)	55	73.15	0.17	0	18.70	48.40	3.30	0.11
Rice (native)	55	81.57	0.05	0	7.97	10.12	unknown	0.27
2. Sticky rice	35	80.15	0.11		4.20	8.40	1.75	0.11
3. Rice noodle, big size	90	109.44	1.16	0	69.08	58.82	4.79	0.07
4. Waxy corn	65	108.55	0.78	0	0	0	6.50	3.25
5. Mungbean noodle	75	79.39	0.10	0	0	0	12.06	0
Vegetables								
1. Tomato	70	18.20	0.21	0	8.40	139.30	5.60	0.91
2. Flower Chinese cabbage	70	15.13	0.26	0	13.16	182.27	117.12	1.71
3. Chinese cabbage	70	10.53	0.13	0	14.48	119.10	46.72	0
4. Cucumber	70	16.10	0.07	0	3.50	116.20	14.00	0.70
5. White Chinese cabbage	70	10.53	0.07	0	30.27	186.87	48.03	1.25

Table 19 The nutritive value of most commonly consumed in each food groups per 1 exchange (49) (cont.)

Food Items	Weight (g)	Energy (kcal)	Fat (g)	Cholesterol (g)	Sodium (mg)	Potassium (mg)	Calcium (mg)	Dietary fiber (mg)
Fruits								
1. Orange	150	67.50	0.30	0	49.50	243.00	43.50	2.25
2. Banana	45	54.90	0.09	0	2.25	111.60	4.50	1.08
3. Ripe papaya	115	47.15	0.11	0	27.60	264.50	17.25	1.49
4. Ripe mango	100	81.00	0.20	0	3.00	126.00	13.00	3.00
5. Unripe mango	80	64.00	0.16	0	2.40	115.20	4.80	0.96
Meats								
1. Pork	30	45.90	2.31	12.00	0.90	105.90	30.30	0
2. Poultry	30	72.30	4.98	36.90	3.60	101.10	37.80	0
3. Nile Tilapia fish	30	26.10	0.33	17.40	15.30	94.80	26.10	0
4. Catfish	30	62.70	4.41	41.7	19.5	86.5	6.00	0
5. Snakehead fish	30	32.7	0.99	44.7	14.7	95.1	7.2	0

Table 19 The nutritive values of most commonly consumed in each food groups per 1 exchange (49) (cont.)

Food Items	Weight (g)	Energy (kcal)	Fat (g)	Cholesterol (g)	Sodium (mg)	Potassium (mg)	Calcium (mg)	Dietary fiber (mg)
Animal products								
1. Hen egg	30	77.50	5.40	213.50	19.00	55.50	89.00	0
2. Deep fried pork skin	30	185.70	13.80	30.23	5.70	0	548.59	0
3. Salted duck egg	30	98.50	7.30	105.00	263.00	76.50	37.00	0
4. Pork ball	30	42.30	1.80	9.90	196.8	56.41	4.72	0
5. Steamed short bodied mackerel	30	41.40	1.32	26.40	244.80	188.70	50.40	0
Dairy products								
1. Soybean milk	1 cup	151.20	7.68	0	120.00	0	33.60	0
2. Soybean milk (UHT)	1 cup	194.40	8.40	9.60	88.80	0	57.50	0.96
3. Yogurt, drinking	1 cup	201.60	3.12	2.40	88.80	0	141.60	0
4. Ovaltine	1 cup	220.80	6.72	19.20	57.60	0	192.00	2.88
5. Milo	1 cup	150.00	4.00	10.00	45.00	250.00	160.00	0

Table 19 The nutritive values of most commonly consumed in each food groups per 1 exchange (49) (cont.)

Food Items	Weight (g)	Energy (kcal)	Fat (g)	Cholesterol (g)	Sodium (mg)	Potassium (mg)	Calcium (mg)	Dietary fiber (mg)
Seasoning								
1. Salt	5	0	0	0	2000.00	0	0	0
2. Monosodium glutamate	5	0	0	0	492.00	0	0	0
3. Soybean sauce	5	0	0	0	483.00	0	0	0
4. Fish sauce	5	0	0	0	400.00	0	0	0
5. Ros-dee (soup instant)	5	0	0	0	2640.00	0	0	0
Desserts								
1. Bread	50	158.45	3.59	13.83	204.50	0	15.83	0.97
2. Crispy rice cracker	40	201.81	9.39	0	159.87	0	8.00	0.49
3. Pa-tong-ko	1 piece	67.35	3.975	4.50	0	0	0	0.13
4. Ka-nom-tien	1 piece	195.20	1.36	0	0	0	0	0.32
5. Glutinous rice steamed with bean and coconut	1 piece	144.25	0.74	0	231.15	56.41	4.72	1.25

Table 20 The nutritive values of most commonly consumed food menus per 1 person

Food Items	Energy (kcal)	Fat (g)	Cholesterol (g)	Sodium (mg)	Potassium (mg)	Calcium (mg)	Dietary fiber (mg)
Soup and curry							
1. Chinese cabbage curry	129.99	7.80	23.50	843.35	276.01	77.97	1.48
2. Tomato chili paste	15.63	0.15	0	380.04	109.41	7.95	0.93
3. Flower Chinese cabbage curry	129.59	7.91	23.50	894.85	140.13	26.11	0.21
4. Dried fermented soybean chili paste	37.22	0.93	0	352.12	54.05	21.50	1.20
5. Num-Ngyo with noodle	690.86	37.39	59.65	2520.25	658.64	87.21	3.27
6. White Chinese cabbage soup	149.81	4.22	19.30	764.32	186.62	34.83	1.88
7. Green chili Dip, Northern style	16.90	0.076	0	364.52	59.80	7.57	1.18
8. Fried pork	257.18	20.63	28.12	514.53	303.83	8.29	0.28
9. Nile tilapia soup	106.45	1.35	58.00	1252.25	426.26	73.39	0.63
10.Fried Nile tilapia	298.30	23.85	58.00	398.54	347.96	52.78	0.46

CHAPTER VI
DISCUSSION

This study investigated the nutritional status in hypertensive patient at Doi Tung Development Project area and nutritive value of indigenous food that was commonly consumed. This chapter discusses the finding and result of the study from the previous chapter (chapter 5).

6.1 Subject characteristics

6.1.1 Socio-demographic characteristics

Two hundred and twenty-nine subjects were enrolled in this study and they were from different tribes as follows: Akha (30.1%), Lahu (29.3%), Tai Yai (20.5), Haw (11.8%), Tai Lue (5.2%), and Lawa (3.1%). The proportion of participants in each tribe varied because the number of patients in each tribe was different. Proportionate allocation was used to calculate the number from each tribe and the hypertensive patients selected were representatives of their tribes.

These socio-demographic characteristics of this study included the subject's gender, religion, marital status, education, occupation, number of household, income and food expenditure. The percentage of males and females in this study were 39.3% and 60.7% respectively, which was consistent with a previous study. The result of previous study showed that males had lower prevalence of hypertension than females (50). The health examination survey (51) reported that the prevalence of hypertension increase with an increase in age increasing by over 50% after the age of 60. The result of this study showed that 43.2% of participants had their age over 60 years and the mean age was 59.41 ± 11.82 years. Most of the participants were Buddhists (55.9%) and more than 70 percent of participants were married (72.5%). Almost all of the subjects were uneducated (94.3%). This was in accordance with a local research study on elderly with diabetes and hypertension at Mae Rai sub-district and Chan Chawa sub-district at Chiang Rai province which found that hill tribes in

northern region of Thailand still lacked access to basic education and health care (52). Majority of participants had income ranging between 2,000 to 6,000 baht per month. Most of the participants were unemployed (40.2%) which may have been due to their age (43.2% of participant had age more than 60). However 33.6% of the participants worked in agriculture.

The study of lifestyles and hypertension among hill tribe of Mae Fah Luang by Duangtep Y. (53) reported that the average age was 55.16 ± 10.91 years with 39.79% and 60.21% of males and females respectively. In addition 86.73% of the hypertensive cases were married. Most were Buddhist (82.67%) and 97.44% were illiterate. The study was consistent with the result of this study.

6.1.2 Health information

The proportions of non-smokers (60.7%) were higher than smokers (39.3%). The relationship between smoking and hypertension was emphasized by a previous study by Groppelli A. et al (54). The study revealed that there was an average elevation in systolic pressure of 20 mmHg after the first cigarette. In addition, smoke increases the risk of secondary cardiovascular complications and enhance the progression of renal insufficiency (55). Most participants did not consume any alcohol (85.2%) and neither exercise (52.8%). Hagberg J., et.al.'s (56) study of exercise and hypertension found that the exercise significantly decrease systolic and diastolic blood pressure in hypertensive patient. The suggestion of JNC 7 included aerobic physical activity such as brisk walking for at least 30 minutes per day and on most days of the week (57). The mean hypertensive duration was 2.89 ± 3.49 years. 19.2% of the participants had complications even though all subjects took hypertensive drugs regularly. Furthermore 89.1% of the subjects received information to control their blood pressure. This was interesting as the complications from hypertension would occur only after a long time about 5-10 years (58).

6.1.3 Blood Pressure

The average systolic and diastolic blood pressures of all subjects were 146.16 ± 22.69 and 85.69 ± 14.49 mmHg respectively. The mean systolic and diastolic blood pressures in males (146.31 ± 22.02 and 89.70 ± 14.98 mmHg respectively) were

slightly higher than that of females (134.50 ± 22.79 and 83.12 ± 13.62 mmHg respectively). This agrees with a previous study that revealed that males in a developing country have been determined as factors associated with poorer blood pressure control (59). Previous research found that the risk of cardiovascular disease is related to blood pressure in ages between 40 to 70 years with blood pressure ranging between 115/75 mmHg and 185/115 mmHg. For an increase of systolic blood pressure by every 20 mm Hg or a diastolic blood pressure by every 10 mm Hg an increase in the risk of cardiovascular disease was found to be by two times (57). To reduce cardiovascular disease and kidney disease, blood pressure should be less than 140/90 mm Hg. In patients with diabetes or kidney disease blood pressure should be controlled to less than 130/80 mmHg (JNC7).

Only 6.7% of participants achieved their blood pressure goal (systolic or diastolic less than 140 mmHg and 90 mmHg respectively) which was similar to the findings of a survey on the prevalence of hypertension that reported that more than 70% of hypertensive subjects were without control (51).

6.2 Nutrition Status

6.2.1 Anthropometric assessment

The study showed that 54.1% of participants were obese (BMI> 25 kg/m^2). Among the subjects 38.4% and 15.7% were classified as obese class I and obese class II respectively. The sixty-four point six percent of all the participants had waist circumference which was more than cut off of World Health Organization classification (40). This result was similar to the results of a study by Diaz M. (60) which found that 74.4% of persons with high blood pressure had body mass index greater than 25 kg/m^2. The studies by Haslam D. (61) revealed that obesity and in particular central obesity have been associated consistently with and increased cardiovascular risk. The study population risk estimates indicated at least two-thirds of people with high blood pressure were obesity.

The mean mid-arm muscle circumference (MAMC) and triceps skinfold (TSF) were 16.93 ± 8.57 cm. and 26.57 ± 3.23 mm respectively. Most of the subjects (50.7%) had triceps skinfold over than standard value. The results also showed that most of subjects (78.2%) had mid arm muscle circumference (MAMC) over than

standard value. The study of skinfold measurement and body size among hypertensive patients found that weight gain was a strong predictor of hypertension (62).

The mean of body fat percentage and visceral fat level were 32.59 ± 7.08 % and 11.21 ± 5.82 respectively. Most participants (68.1%) had body fat percentage at very high level whereas 55.5% of all had visceral fat at normal level. Sironi A. et al. revealed that visceral adiposity had related to both height of blood pressure and severity of insulin resistance (63). Junko Watanabe found that visceral fat is considered useful in estimating visceral fat accumulation, and seems more effective than BMI for predicting multiple cardiovascular risk factors in obese hypertensive men.

6.2.2 Dietary Assessment

The average energy intake for all participants was found to be 1,539.80 ± 987.71 kcal per day. 69.4 % of the total energy was from carbohydrates, 14.6% form fat and 16.0% from protein. The proportion of carbohydrate was high whereas protein and fat was low. Evidence from various randomized controlled trials report that low carbohydrate diets was better than traditional low fat high carbohydrate for weight reduction as well as control of blood pressure (64). The mean of sodium intake per day was 3,186.03 ± 1,584.79 mg which was higher than the recommendations of Dietary Approach to Stop Hypertension (DASH diet) diet. Whereas mean cholesterol (121.47 ± 98.37 g) potassium (1,904.41 ± 803.14 mg), calcium (327.38 ± 140.55 mg) and dietary fiber (10.0 ± 6.55 mg) intake were lower than DASH diet recommendation. According to the local research study in elderly with diabetes and hypertension at Mae Rai sub-district and municipality of Chan Chawa sub-district, Mae Chan district, Chiang Rai province reported that the sticky rice is the most commonly consumed starch among subjects. Subjects restricted sweet, salty and fatty diet but still put monosodium glutamate in their foods. Moreover they consumed ready-to-eat food that contains high content of monosodium glutamate.

The study of consumption of sodium chloride in Thailand in 2550-2551 (65) found that Thai consumes sodium average 4.8 g. per day which was also higher than recommendations. Several studies found that decreasing salt intake is advisable to reduce the risk of coronary heart disease, stroke, congestive heart failure, and kidney

disease. Sodium intake, the natural salt content of food accounts for only about 10 percent of total intake, while discretionary salt use (i.e., salt added at the table or while cooking) provides another 5 to 10 percent of total intake (66).

6.3 Most Frequently Consumed Foods and their Nutritive values

The result of most frequently consumed foods in this study found that the food item and menus was similar among six hill tribes due to availability of food was the same.

Most of participants consumed rice everyday so rice is main source of carbohydrate among hill tribe at Doi Tung Development Project area. The rice was consumed among hill tribe is different kind from general rice and nutritive values also difference. The native rice has energy and dietary fiber higher than general rice whereas sodium and potassium are lower. The native rice is high in dietary fiber and low in sodium which appropriate for hypertensive patient. However native rice should be consumed moderately due to energy. Top 5 of vegetable group have low sodium and high potassium content pre 1 serving (70 g of cooked weight) whereas have low calcium content except flower Chinese cabbage. Flower Chinese cabbage gives highest calcium (117.12 mg), potassium (182.27 mg) and dietary fiber (1.71 mg) among vegetable group which is beneficial to control blood pressure.

In meat and meat production groups, commonly consumed food items were pork, poultry, Nile Tilapia fish, catfish, hen egg, deep fried pork skin, etc which is a source protein. There is no seafood available due to the terrain is hilly mountain area. The most of subjects commonly consumed soybean milk due to price and food available. But soybean milk contains highest sodium and lowest calcium compare with in dairy product group which is inappropriate for hypertensive patient.

Oil and nut is source of fat among hill tribe and top 5 of the most commonly consumed were soybean oil, palm oil, peanut, white-sesame and lard oil which palm oil and lard oil had high saturated fatty acid lead to increase the risk of cardiovascular disease.

Most of participant usually cooks curry or soup and chili paste which was consistent with Top 10 of most frequently consumed food menus. The menus that contain high sodium were Num-Ngyo with noodle and Nile tilapia soup while menus

have lowest sodium was dried fermented soybean chili paste. To compare sodium with method by found that curry or soup has sodium higher than chili paste due to the proportion of 1 serving.

The nutritive value of local food may help hypertensive patient understanding how to suitably control their blood pressure by using appropriate food which is available in local area.

CHAPTER VII
CONCLUSION

This study was to determine the nutritive values of local foods and the nutritional status in people with hypertension at Doi Tung Development Project area. The result of nutritional status found that most of participants were obese especially abdominal obesity and had excessive body fat percentage while they were unable to control their systolic and diastolic blood pressure level. That may result from inappropriate food consumption. Most participants consumed high carbohydrate and sodium intake whereas consumed food that contain of potassium, calcium and dietary fiber lower than DASH diet recommendation.

A most commonly consumed indigenous foods of some items or menus such as native rice, flower Chinese cabbage and tomato chili paste have high potassium, calcium and fiber but low sodium, which is appropriate for hypertensive patients.

This finding may help health care providers in effective dietary intervention and counseling for hypertensive hill tribes in order to improve the quality of life.

Suggestion

1. Dietitian or health care provider can recommend appropriate dietary pattern for hypertension patients according to most commonly consumed foods at Doi Tung Development Project area.

2. The result from nutritional status among hypertension patients at Doi Tung Development Project area may useful to establish health promotion and prevention policy.

3. Development of standardized healthy recipes from local food and the dissemination of their health benefits to promote local food marketing.

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APPENDICES

APPENDIX A

แบบสัมภาษณ์

สภาวะสุขภาพและอาหารพื้นบ้านของผู้ที่เป็นความดันโลหิตสูงนิยมรับประทาน

แบบสัมภาษณ์นี้เพื่อประโยชน์ในงานวิจัยเกี่ยวกับ “คุณค่าทางโภชนาการ ของอาหารพื้นบ้าน และสภาวะโภชนาการ ของผู้ที่เป็นโรคความดันโลหิตสูงบน พื้นที่โครงการพัฒนา ดอยตุง จังหวัดเชียงราย” ของนักศึกษาปริญญาโท สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล โดยมีวัตถุประสงค์เพื่อศึกษาสภาวะสุขภาพและอาหารพื้นบ้านที่ผู้เป็นความดันโลหิตสูงนิยมรับประทาน

แบบสัมภาษณ์ประกอบด้วย 3 ส่วน ดังนี้

ส่วนที่ 1 ข้อมูลทั่วไป จำนวน 18 ข้อ

ส่วนที่ 2 ข้อมูลเกี่ยวกับสภาวะสุขภาพ จำนวน 11 ข้อ

ส่วนที่ 3 ข้อมูลเกี่ยวกับอาหารที่บริโภค (แบบสัมภาษณ์ความถี่ในการบริโภคอาหารของผู้ที่เป็นโรคความดันโลหิตสูง)

ข้อมูลที่ได้จากการเก็บรวบรวมในครั้งนี้จะนำไปประเมินสภาวะสุขภาพและ วิเคราะห์คุณค่าทางโภชนาการ ในอาหารที่ ผู้เป็นโรคความดันโลหิตสูงนิยมรับ ประทาน ข้อมูลทั้งหมดจะถือเป็นความลับ โดยข้อมูลที่ได้จากการประเมินและวิเคราะห์จะเป็นแนวทางในการ แนะนำการบริโภคอาหารที่เหมาะสมแก่ผู้ที่เป็นความดันโลหิตสูงต่อไป

โปรดตอบคำถามให้ตรงกับความเป็นจริงมากที่สุด

ขอขอบคุณที่ให้ความร่วมมือ มา ณ โอกาสนี้

นางสาวปรารถนา ตปนีย์

นักศึกษาปริญญาโท

หลักสูตรอาหารและโภชนาการเพื่อการพัฒนา

สาขาอาหารเพื่อการป้องกันและบำบัด

สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล

ส่วนที่ 1: ข้อมูลทั่วไป

ชื่อ - สกุล..... **เพศ** (.....) ชาย, (.....) หญิง

อายุ..... **ปี** **วันเดือนปีที่สัมภาษณ์** ...../...../ 2551

กรุณาขีด ✔ลงใน (.....) ที่ตรงกับข้อมูลของตัวท่าน

1. เชื้อชาติ/เผ่าพันธุ์ (.....) ไทใหญ่ (.....) อาข่า/อีก้อ
(.....) ลาหู่/มูเซอ (.....) จีนฮ่อ
(.....) ไทลื้อ (.....) ลัวะ
(.....) อื่นๆ ระบุ.....

2. ศาสนา (.....) พุทธ (.....) คริสต์
(.....) อิสลาม (.....) อื่นๆ ระบุ..... .....

3. สถานภาพสมรส (.....) โสด (.....) อยู่ด้วยกัน
(.....) หม้าย (.....) หย่า/แยกกันอยู่

4. พื้นฐานการศึกษา (.....) ไม่ได้รับการศึกษา
(.....) ต่ำกว่าประถมศึกษาปีที่ 4
(.....) จบชั้นประถมศึกษาปีที่ 4 (ป.4)
(.....) จบชั้นประถมศึกษาตอนปลาย (ป. 7 หรือ ป.6)
(.....) จบชั้นมัธยมศึกษาตอนต้น (มศ. 3 หรือ ม.3)
(.....) จบชั้นมัธยมศึกษาตอนปลาย (มศ. 5 หรือ ม.5 หรือ ปวช.)
(.....) จบอนุปริญญา (ปวส.)
(.....) อื่นๆ ระบุ.....

5. การประกอบอาชีพหลัก

(.....) เกษตรกรรม เกษตรกรรม ระบุ .....

(.....) ค้าขาย (.....) รับจ้างทั่วไป

(.....) ข้าราชการ (.....) ลูกจ้าง

(.....) อื่นๆ ระบุ.....

6. สมาชิกครอบครัวที่อาศัยอยู่ในบ้านท่าน

(.....) พ่อ-แม่ (.....) ปู่ย่า-ตายาย

(.....) ลูก-หลาน (.....) เหลน

(.....) อื่นๆ ระบุ..... .....

7. รายได้ของครอบครัว

(.....) น้อยกว่า 2000 บาท/เดือน (.....) 2000 - 6000 บาท/เดือน

(.....) 6001 - 10000 บาท/เดือน (.....) มากกว่า 10000 บาท/เดือน

(.....) อื่นๆ ระบุ.....

8. รายจ่ายค่าอาหารของครอบครัวต่อวัน.....บาท

9. บุคคล<u>หลัก</u>ที่จัดซื้อหรือหาอาหารมาประกอบในครัวเรือน

(.....) ตัวท่านเอง (.....) คู่สมรส

(.....) ลูกหลาน (.....) ลูกจ้าง

(.....) อื่นๆ ระบุ..... .....

10. ที่บ้านของท่านจัดซื้อ<u>ผัก</u> เช่น ผักกวางตุ้ง ผักบุ้ง ผักกาดขาว ฯลฯ <u>บ่อยครั้งเพียงใด</u>

(.....) ทุกวัน (.....) บ่อยครั้ง (5-6 ครั้ง/สัปดาห์)

(.....) บางครั้ง (1-4 ครั้ง/ สัปดาห์) (.....) นานๆ ครั้ง (≤ 4 ครั้ง/เดือน)

(…...) ไม่เคย (.....) อื่นๆ ระบุ.....

11. ที่บ้านของท่านจัดซื้อ<u>เนื้อสัตว์</u> เช่น เนื้อหมู ปลา เนื้อไก่ ฯลฯ บ่อยครั้งเพียงใด

(.....) ทุกวัน (.....) บ่อยครั้ง (5-6 ครั้ง/สัปดาห์)

(.....) บางครั้ง (1-4 ครั้ง/ สัปดาห์) (.....) นานๆ ครั้ง (≤ 4 ครั้ง/เดือน)

(…...) ไม่เคย (.....) อื่นๆ ระบุ.....

12. ที่บ้านของท่านจัดซื้ออาหารแห้ง/วัตถุดิบที่ใช้ปรุงอาหาร/เครื่องปรุงรสต่างๆ บ่อยครั้งเพียงใด

(.....) ทุกวัน (.....) บ่อยครั้ง (5-6 ครั้ง/สัปดาห์)

(.....) บางครั้ง (1-4 ครั้ง/ สัปดาห์) (.....) นานๆ ครั้ง (≤ 4 ครั้ง/เดือน)

(…...) ไม่เคย (.....) อื่นๆ ระบุ.....

13. ที่บ้านของท่านจัดซื้อหาอาหารสำเร็จรูปบ่อยครั้งเพียงใด

(.....) ทุกวัน (.....) บ่อยครั้ง (5-6 ครั้ง/สัปดาห์)

(.....) บางครั้ง (1-4 ครั้ง/ สัปดาห์) (.....) นานๆ ครั้ง (≤ 4 ครั้ง/เดือน)

(…...) ไม่เคย **(ข้ามไปข้อ 16)** (.....) อื่นๆ ระบุ.....

14. ครัวเรือนได้จัดซื้อหรือจัดหาผัก เช่น ผักกวางตุ้ง ผักบุ้ง ผักกาดขาว ฯลฯ จากแหล่งใดมากที่สุด

(…...) ปลูกหรือหามาเอง (.....) ร้านขายของชำในหมู่บ้าน

(.....) รถที่เข้ามาขายของ (.....) ตลาดประจำหมู่บ้าน

(.....) อื่นๆ ระบุ..... .....

15. ครัวเรือนได้จัดซื้อหรือจัดหาเนื้อสัตว์ เช่น เนื้อหมู ปลา เนื้อไก่ ฯลฯ จากแหล่งใดมากที่สุด

(…...) หามาเอง (.....) ร้านขายของชำในหมู่บ้าน

(.....) รถที่เข้ามาขายของ (.....) ตลาดประจำหมู่บ้าน

(.....) อื่นๆ ระบุ..... .....

16. วัตถุดิบในการประกอบอาหารแห้งและเครื่องปรุงรสต่างๆ จากแหล่งใดมากที่สุด

(…...) ปลูกหรือหามาเอง (.....) ร้านขายของชำในหมู่บ้าน

(.....) รถที่เข้ามาขายของ (.....) ตลาดประจำหมู่บ้าน

(.....) อื่นๆ ระบุ..... .....

17. วิธีการประกอบอาหารในครัวเรือนที่ทำเป็นประจำ โดยเรียงจากวิธีการประกอบอาหารในครัวเรือนที่ทำบ่อยที่สุดไปหาน้อยที่สุด 1, 2, 3 ... ตามลำดับ

(.....) ผัด/ทอด (.....) น้ำพริก

(.....) นึ่ง/ตุ๋น (.....) ต้ม /แกง

(.....) ปิ้ง/ย่าง (.....) อื่นๆ ระบุ..... .....

18. ท่านเติมน้ำปลา หรือซอสปรุงรสเพิ่มในอาหาร ก่อนรับประทานหรือไม่

(.....) ไม่เติม (.....) เติม ..... ช้อนชา/มื้อ

ส่วนที่ 2: ข้อมูลเกี่ยวกับสภาวะสุขภาพ

19. ท่านสูบบุหรี่/ยาเส้น/ยาสูบหรือไม่ (…...) สูบบุหรี่/ยาเส้น/ยาสูบ..... มวน/วัน

(.....) ไม่สูบบุหรี่

20. ท่านดื่มเหล้า/สุราหรือไม่ (.....) ไม่ดื่ม

(…...) ดื่มเป็นบางครั้ง

(…...) ดื่มเป็นประจำ

(…...) เหล้าขาว.....แก้ว/ขวดต่อวัน

(…...) เหล้าโรง.....แก้ว/ขวดต่อวัน

(.....) เหล้าแดง .....แก้ว/ขวดต่อวัน

(…...) เบียร์.....แก้ว/ขวด/กระป๋อง

ต่อวัน (.....) อื่นๆ ระบุ

.....

21. ท่านเคยลดน้ำหนักตัวหรือไม่ (.....) ไม่เคย

(…...) เคย น้ำหนักลดลง _____กิโลกรัม

ภายในเวลา _____

โดยใช้วิธี _____

22. ระยะเวลาที่ได้รับการวินิจฉัยว่าเป็นโรคความดันโลหิตสูง _____ปี_____ _____ เดือน

23. มีบุคคลในครอบครัวท่านเป็นโรคความดันโลหิตสูงหรือไม่

(.....) ไม่มี

(.....) มี (ตอบได้มากกว่า 1 ข้อ)

(.....) พ่อ / แม่ (.....) สามี / ภรรยา

(.....) บุตร (.....) พี่ / น้อง

(.....) อื่น ระบุ.....

24. ท่านมีโรคดังต่อไปนี้ร่วมด้วยหรือไม่ (ตอบได้มากกว่า 1 ข้อ)

(.....) ไขมันในเลือดสูง (.....) โรคหัวใจ

(.....) โรคไต (.....) อื่นๆ ระบุ.....

25. สถานที่ที่ท่านไปรับการ<u>รักษาโรคความดันโลหิตสูง</u>

25.1) สถานีอนามัย พื้นที่โครงการพัฒนาดอยตุง อำเภอแม่ฟ้าหลวง จังหวัดเชียงราย

(…...) สถานีอนามัยดอยตุง (.....) สถานีอนามัยห้วยน้ำขุ่น

(.....) สถานีอนามัยป่ายาง (.....) สถานีอนามัยสามัคคีใหม่

25.2) สถานีอนามัย พื้นที่โครงการพัฒนาดอยตุง อำเภอแม่สาย จังหวัดเชียงราย

(…...) สถานีอนามัยผาหมี (.....) สถานีอนามัยผาฮี้

25.3) โรงพยาบาลรัฐบาล จังหวัดเชียงราย

(…...) โรงพยาบาลอำเภอแม่จัน

(.....) โรงพยาบาลอำเภอแม่ฟ้าหลวง

(.....) โรงพยาบาลอำเภอแม่สาย

(.....) โรงพยาบาลเชียงรายประชานุเคราะห์

(.....) อื่นๆ ระบุ.....

25.4) โรงพยาบาล/คลินิกเอกชน ระบุ.....

26. ท่านทราบค่าระดับความดันโลหิตของท่านล่าสุดหรือไม่

(.....)ไม่ทราบ (.....) ทราบ

ระดับความดันโลหิตล่าสุดคือ _____ / _____ มิลลิเมตรปรอท (เมื่อวันที่.....)

ค่าระดับความดันโลหิตของท่านเมื่อเทียบกับค่าปกติท่านคิดว่าจัดอยู่ในเกณฑ์:

(.....) สูง (…..) ปกติ

(.....) ต่ำ (.....) ไม่ทราบ

28. ท่านออกกำลังกายบ้างหรือไม่

(…..) ไม่ออกกำลังกาย

(…..) ออกกำลังกาย

ชนิดของการออกกำลังกาย ……

เวลาที่ใช้ออกกำลังกายในแต่ละครั้ง ……....นาที

ความถี่ในการออกกำลังกาย .....ครั้ง /สัปดาห์

29. ท่านเคยได้รับความรู้ด้านการปรุงประกอบอาหารและรับประทานอาหาร เพื่อควบคุมระดับความดันเลือดหรือไม่

(.....) ไม่เคย

(.....) เคย

(.....) แพทย์/พยาบาล

(.....) เจ้าหน้าที่สถานีอนามัย/เจ้าหน้าที่สาธารณสุขประจำท้องถิ่น

(.....) นักโภชนาการ /นักกำหนดอาหารประจำโรงพยาบาล

(.....) เรียนรู้ด้วยตนเอง

(…...) โปสเตอร์ (.....) โทรทัศน์

(.....) แผ่นพับ (.....) หนังสือคู่มือ

(.....) คำบอกเล่า จากแหล่ง..... .....

(.....) อื่นๆ ระบุ..... .....

แบบสัมภาษณ์ความถี่ในการบริโภคอาหารของผู้ที่เป็นโรคความดันโลหิตสูง

ชื่อ - สกุล..... **เพศ** (.....) ชาย, (.....) หญิง

อายุ..... **ปี** **วันเดือนปีที่สัมภาษณ์** ...../...../ 2551

คำอธิบาย: สัมภาษณ์ข้อมูลการรับประทานอาหารของผู้ที่เป็นโรคความดันโลหิตสูง โดยใช้แบบสัมภาษณ์ความถี่ในการบริโภคอาหารของผู้ที่เป็นโรคความดันโลหิตสูง ซึ่งแบ่งออกเป็น 2 ตอนดังนี้

ตอนที่ 1 ข้อมูลชนิดและความถี่การบริโภคหมวดอาหาร 5 หมู่ (หน้า 2-9)

ตอนที่ 2 ข้อมูลรายการอาหารและความถี่ในการบริโภคอาหาร (หน้า 10-13)

แนวคำถาม: 1. สอบถามชนิดของอาหารในแต่ละหมวดที่ไม่รับประทาน

2. อาหารประเภทอื่นของแต่ละหมวดรับประทานบ่อยแค่ไหน เช่น ในหมวดผัก ท่านรับประทานเห็ดนางฟ้าบ่อยแค่ไหน ?

3. สอบถามอาหารประเภทอื่นของแต่ละหมวดที่รับประทาน ที่นอกเหนือจากรายการสัมภาษณ์ รวมทั้งความถี่ในการรับประทานอาหารชนิดนั้นๆ

4. สอบถามรายการอาหารของแต่ละชนเผ่าที่รับประทานบ่อยที่สุด และสอบถามความถี่ของการรับประทานรายการอาหารนั้นๆ

5. สอบถามรายการอาหารอื่นที่แต่ละชนเผ่ารับประทาน ที่นอกเหนือจากรายการสัมภาษณ์ รวมทั้งความถี่ในการรับประทานอาหารชนิดนั้นๆ

ขอขอบคุณที่ให้ความร่วมมือ มา ณ โอกาสนี้

นางสาวปรารถนา ตปนีย์

นักศึกษาปริญญาโท

หลักสูตรอาหารและโภชนาการเพื่อการพัฒนา

สาขาอาหารเพื่อการป้องกันและบำบัด

สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล

ตอนที่ 1 ข้อมูลชนิดและความถี่การบริโภคหมวดอาหาร 5 หมู่

วัตถุประสงค์: ศึกษาชนิดของรายการอาหารในหมวดอาหาร 5 หมู่ ที่ผู้เป็นโรคความดันโลหิตสูงนิยมบริโภคบ่อยที่สุด

Code	หมวดอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AS 1	ข้าว/แป้ง	ข้าวเจ้า					
AS 2		ข้าวกล้อง					
AS 3		ข้าวเหนียว					
AS 4		ข้าวกั่ม (ข้าวเหนียวดำ)					
AS 5		เส้นก๋วยเตี๋ยวเล็ก/ใหญ่					
AS 6		ขนมเส้น (ขนมจีน)					
AS 7		เส้นหมี่เหลืองพม่า					
AS 8		วุ้นเส้น					
AS 9		เผือก					
AS 10		มันเทศ					
AS 11		มันฝรั่ง					
AS 12		ฟักทอง					
AS 13		ข้าวสาลี					
AS 14		ข้าวโพด					
AS 15		ถั่วเหลือง					
AS 16		ลูกเดือย					
AS 17							
AS 18							
AS 19							
AS 20							
AS 21							

Code	ประเภทอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AV 1	ผัก	กะหล่ำปลี					
AV 2		ดอกกะหล่ำ					
AV 3		ผักกาดขาว					
AV 4		ผักกาดขาวปลี					
AV 5		ผักกาดอ่อน					
AV 6		ผักกาดดอก					
AV 7		ผักกาดเขียว					
AV 8		ผักกาดกวางตุ้ง					
AV 9		ผักบุ้งจีน					
AV 10		คะน้า					
AV 11		ตำลึง (ผักแคบ)					
AV 12		ผักปั๋ง					
AV 13		ผักหละ (ชะอม)					
AV 14		ผักหวาน					
AV 15		ผักฮี้					
AV 16		ยอดขี้เหล็ก					
AV 17		ยอดลันเตา					
AV 18		ถั่วน้อย (ถั่วลันเตา)					
AV 19		ถั่วฝักยาว					
AV 20		ถั่วแขก					
AV 21		ถั่วพู					
AV 22		หัวไชเท้า					
AV 23		แครอท					
AV 24		ข้าวโพดอ่อน					
AV 25		มะเขือเทศ.....					
AV 26		พริกหวาน					

Code	ประเภทอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AV 27	ผัก	บะแตง (แตงกวา)					
AV 28		น้ำเต้า (บะน้ำ)					
AV 29		บะนอย (บวบ)					
AV 30		บะฟัก (ฟักเขียว)					
AV 31		บะเขือมื้น (กระเจี๊ยบเขียว)					
AV 32		มะระ					
AV 33		มะระขี้นก					
AV 34		ยอดฟักแม้ว (ยอดมะระหวาน)					
AV 35		ฟักแม้ว (มะเขือเครือ)					
AV 36		มะเขือยาว					
AV 37		มะเขือเปราะ					
AV 38		บะแขว้งขม (มะเขือพวง)					
AV 39		ลิ้นไม้					
AV 40		หน่อขม					
AV 41		หน่อหวาน					
AV 42		หน่อไผ่ตง					
AV 43		เห็ดนางฟ้า					
AV 44		เห็ดหูหนูขาว/ดำ					
AV 45		เห็ดเฟือง (เห็ดฟาง)					
AV 46		เห็ดห้า					
AV 47		เห็ดหอม					
AV 48		ผักขม					
AV 49		ยอดฟักทอง					
AV 50		ผักเลิ้น					
AV 51		รากชู					
AV 52		ผักข้าวตอง					

Code	ประเภทอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AF 1	ผลไม้	กล้วย.....					
AF 2		เงาะ					
AF 3		บะกล้วยก๋า (ฝรั่ง)					
AF 4		แอปเปิ้ล (แดง/เขียว)					
AF 5		สาลี่					
AF 6		บะตื๋น (กระท้อน)					
AF 7		น้อยหน่า					
AF 8		มังคุด					
AF 9		ลองกอง					
AF 10		มันแกว					
AF 11		ส้มเขียวหวาน					
AF 12		ส้มเช้ง					
AF 13		ส้มโอ					
AF 14		ขนุนสุก					
AF 15		บะตัน (พุทรา)					
AF 16		ชมพู่.....					
AF 17		องุ่น (เขียว/ม่วง)					
AF 18		มะม่วง (ดิบ)					
AF 19		มะม่วง (สุก)					
AF 20		กล้วยเตดสุก (มะละกอสุก)					
AF 21		ขนัด (สับปะรด)					
AF 22		แคนตาลูป					
AF 23		แตงลาย (แตงไทย)					
AF 24		บะเต้า (แตงโม)					
AF 25		แก้วมังกร					
AF 26		ทุเรียน					

Code	ประเภทอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AF 27		มะพร้าวอ่อน					
AF 28		ลิ้นจี่					
AF 29		ลำใย					
AF 30		เชอรี่					
AF 31		บะหลอด					
AM 1	เนื้อสัตว์	เนื้อหมู					
AM 2		เนื้อไก่					
AM 3		เนื้อวัว					
AM 4		เนื้อควาย					
AM 5		เนื้อสุนัข					
AM 6		ปลาช่อน (ปลาหลิม)					
AM 7		ปลาดุก					
AM 8		ปลานิล					
AM 9		ปลาทับทิม					
AM 10		ปลาขาว					
AM 11		ปลาทราย					
AM 12		หมูป่า					
AM 13		ปลาไหล (ปลาเหยี่ยน)					
AM 14		หอยขม					
AM 15		หอยนางรม					
AM 16		หอยแครง					
AM 17		หอยแมลงภู่					
AM 18		กบ					
AM 19		ปู……..					
AM 20		กุ้ง……..					
AM 21		หมึก.....					

Code	ประเภทอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AP 1	ผลิตภัณฑ์	ไข่ (ไก่/เป็ด)					
AP 2	เนื้อสัตว์	ไข่เค็ม					
AP 4		ไข่เยี่ยวม้า					
AP 5		เต้าหู้.....					
AP 6		ลูกชิ้น (ไก่/หมู/วัว/.....)					
AP 7		ลูกชิ้นปลาทอด					
AP 8		ฮ๊อตดอก					
AP 9		เล็บมือนาง					
AP 10		ปูอัด					
AP 11		ปลาทูแข่ง					
AP 12		ปลาทู (เค็ม / มัน)					
AP 13		ปลาหมึกแห้ง					
AP 14		หมูยอ					
AP 15		หมูหยอง					
AP 16		กุ้งแห้ง					
AP 17		กุนเชียง					
AP 18		ไส้กรอก (ไส้อั่ว)					
AP 19		แคบหมู					
AP 20		หนังปอง					
AP 21		น้ำหนัง					
AP 22		จิ้นส้ม (แหนม)					
AP 23							
AP 24							
AP 25							

code	ประเภทอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AC 1	นมและ	น้ำเต้าหู้					
AC 2	ผลิตภัณฑ์	ไมโล					
AC 3		โอวัลติน					
AC 4		นมถั่วเหลือง ตรา					
AC 5		นมจืด ตรา					
AC 6		นมหวาน ตรา.....					
AC 7		นมเปรี้ยว ตรา					
AC 8							
AC 9							
AC 10							
AO 1	ไขมัน	น้ำมันถั่วเหลือง					
AO 2		น้ำมันปาล์ม					
AO 3		น้ำมันหมู					
AO 4		งาขาว					
AO 5		งาดำ					
AO 6		ถั่วดิน (ถั่วลิสง)					
AO 7		มะม่วงหิมพานต์					
AO 8		ถั่วปากอ้า					
AO 9		เมล็ดทานตะวัน					
AO 10		เมล็ดฟักทอง					
AO 11							
AO 12							
AO 13							
AO 14							

code	ประเภทอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AG 1	น้ำตาลและ	น้ำตาลทรายขาว					
AG 2	อาหารอื่นๆ	น้ำตาลทรายแดง					
AG 3		น้ำตาลปี๊บ					
AG 4		น้ำอ้อยก้อน					
AG 5		เกลือ					
AG 6		ผงชูรส					
AG 7		คะนอร์					
AG 8		รสดี					
AG 9		น้ำปลา					
AG 10		ซีอิ๊วขาว					
AG 11		ซอสพริก					
AG 12		ซอสมะเขือเทศ					
AG 13		น้ำจิ้มไก่					
AG 14		เต้าหู้ยี้					
AG 15		หน่อไม้ดอง……					
AG 16		หัวไชเท้าดอง					
AG 17		ผักกาดดอง.....					
AG 18		ผลไม้ดอง.....					
AG 19							
AG 20							
AG 21							
AG 22							
AG 23							
AG 24							
AG 25							

ตอนที่ 2: ข้อมูลรายการอาหารและความถี่ในการบริโภคอาหาร

วัตถุประสงค์: ศึกษารายการอาหารที่ผู้เป็นโรคความดันโลหิตสูงนิยมบริโภคบ่อยที่สุด ในชีวิตประจำวัน

Code	**ประเภทอาหาร**	**รายการ**	**ประจำทุกวัน**	**บ่อยครั้ง 5-6 ครั้ง/สัปดาห์**	**บางครั้ง 1-4 ครั้ง/สัปดาห์**	**นานๆ ครั้ง ≤ 4 ครั้ง/เดือน**	**ไม่รับประทาน**
AC 1	**แกง**	แกงส้ม					
AC 2		แกงแลน					
AC 3		แกงปูใส่ผักกูด					
AC 4		จอผักกาด (ปลา/หมู/.....)					
AC 5		แกงแค (ไก่/หมู/ปลา/.....)					
AC 6		แกงอ่อม (ไก่/หมู/วัว/.....)					
AC 7		แกงขนุน (หมู/…….....)					
AC 8		แกงผักฮี้ (ไก่/หมู/ปลา/.....)					
AC 9		แกงผักกาด (ไก่/หมู/.....)					
AC 10		แกงหน่อส้ม (ไก่/หมู/.....)					
AC 11							
AC 12							
AC 13							
AC 1	**ต้ม**	ต้มปลานิล					
AC 2		ต้มหน่อไม้					
AC 3		ต้มมันอลู (หมู/…….....)					
AC 4		ต้มจืด……..					
AC 5							
AC 6							
AC 7							
AC 8							
AC 9							

code	ประเภทอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AF 1	**ผัด/ทอด**	ผัดกะเพราใส่ปลา					
AF 2		เนื้อสัตว์ทอด ระบุ					
AF 3							
AF 4							
AF 5							
AF 6							
AF 7		ผัดผัก ระบุ					
AF 8							
AF 9							
AF 10							
AF 11							
AF 12							
AP 1	**น้ำพริก**	น้ำพริกถั่วเน่า					
AP 2		น้ำพริกอ่อง					
AP 3		น้ำพริกมะเขือเทศ					
AP 4		น้ำพริกปลาร้า					
AP 5		น้ำพริกเห็ดหูหนู					
AP 6		น้ำพริกหนุ่ม					
AP 7		น้ำพริกน้ำปู					
AP 8		น้ำพริกปู					
AP 9		น้ำพริกดักแด้					
AP 10		น้ำพริกปลาทู					
AP 11							
AP 12							

code	ประเภทอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AY 1	**ยำ**	ยำวุ้นเส้น					
AY 2		ยำหน่อไม้					
AY 3		ยำหมูยอ					
AY 4		ยำไก่บ้าน					
AY 5		ยำแหนม					
AY 6		ยำผักกาด					
AY 7		ยำมะเขือ					
AY 8							
AY 9							
AY 10							
AE 1	**อาหาร**	แอ๊บ (หมู/ปลา					
AE 2		คั่วแฮ้มหมา					
AE 3		แอ๊บปลาซิว					
AE 4		ลาบแพะ					
AE 5		ลาบ(ปลา/ไก่/หมู/วัว/					
AE 6		หลู่ (หมู/วัว/					
AE 7		ส่า (หมู/วัว/					
AE 8		ตำมะเขือ					
AE 9		ข้าวซอยน้ำเงี้ยว					
AE 10		ข้าวแรมฟืน					
AE 11							
AE 12							
AE 13							
AE 14							
AE 15							

code	ประเภทอาหาร	รายการ	ประจำทุกวัน	บ่อยครั้ง 5-6 ครั้ง/สัปดาห์	บางครั้ง 1-4 ครั้ง/สัปดาห์	นานๆ ครั้ง ≤ 4 ครั้ง/เดือน	ไม่รับประทาน
AD 1	**ขนม**	กล้วยบวชชี					
AD 2		ขนมถ้วยฟู					
AD 3		ขนมปัง					
AD 4		ข้าวเหนียวดำเปียก					
AD 5		เต้าส่วน					
AD 6		ทองหยอด					
AD 7		ทองหยิบ					
AD 8		บวชฟักทอง					
AD 9		ลอดช่อง					
AD 10		ลูกเดือยต้มน้ำตาล					
AD 11		วุ้นเย็น					
AD 12		ข้าวแอ๊บ					
AD 13		ข้าวแต๋น					
AD 14		ข้าวควบ					
AD 15		บัวลอยไข่หวาน					
AD 16		ขนมชั้น					
AD 17		ขนมจ๊อก (ขนมเทียน)					
AD 18		ข้ามหลามกะทิ					
AD 19		ข้าวต้มมัด					
AD 20		ข้าวปุ๊ก					
AD 21		กล้วยทอด					
AD 22		ซาลาเปา					
AD 23		ปาท่องโก๋					
AD 24							
AD 25							

APPENDIX B

Frequency of most commonly consumed food according to tribes.

Table A-1 Most frequently consumed of food groups among Akha tribe.

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
เมนูอาหาร	1	แกงผักกาดต้น	169
	2	ผัดผัก (ถั่วฝักยาว)	142
	3	น้ำพริกมะเขือเทศ	140
	4	แกงผักกาดดอก	128
	5	น้ำพริกถั่วเน่า	118
	6	ยำผักกาดดอก	107
	7	หมูทอด	106
	8	ลาบหมู	99
	9	ต้มปลานิล	91
	10	ปลาทอด	87
ข้าว/แป้ง	1	ข้าวเจ้า	248
	2	วุ้นเส้น	68
	3	ข้าวโพดสาลี	64
	4	ก๋วยเตี๋ยวเส้นใหญ่	62
	5	ก๋วยเตี๋ยวเส้นเล็ก	55
ผัก	1	มะเขือเทศ	158
	2	ผักกาดดอก	131
	3	ผักกาดต้น	112
	4	แตงกวา	107
	5	ถั่วฝักยาว	101
ผลไม้	1	ส้มเขียวหวาน	105
	2	ลิ้นจี่	100

Table A-1 Most frequently consumed of food groups among Akha tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
ผลไม้	3	กล้วย	98
	4	มะม่วง (ดิบ)	96
	4	มะม่วง (สุก)	96
เนื้อสัตว์	1	เนื้อหมู	200
	2	เนื้อไก่	88
	3	ปลานิล	63
	4	ปลาขาว	51
	5	ปลาทราย	49
ผลิตภัณฑ์	1	ไข่ไก่	125
จากเนื้อสัตว์	2	ไข่เค็ม	79
	3	ปลาทูเค็ม	68
	4	แคบหมู	66
	5	หนังปอง	65
นม	1	น้ำเต้าหู้	50
	2	นมถั่วเหลือง ตราแลคตาซอย	27
	3	โอวัลติน	26
	4	ไมโล	11
	5	นมรสหวาน ตราโฟโมสต์	9
น้ำมัน	1	น้ำมันปาล์ม	106
	2	ถั่วลิสง	97
	3	น้ำมันถั่วเหลือง	86
	4	งาดำ	35
	5	งาขาว	26
เครื่องปรุง	1	เกลือ	225
	2	ผงชูรส	189
	3	ถั่วเน่า	58
	4	รสดี	56
	5	ซีอิ้วขาว	49

Table A-1 Most frequently consumed of food groups among Akha tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
ขนมหวาน	1	ข้าวปุก	28
	2	ข้าวแต๋น	27
	3	ปาท่องโก๋	26
	4	ขนมปัง	20
	5	บวชฟักทอง	19

Table A-2 Most frequently consumed of food groups among Lahu tribe.

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
เมนูอาหาร	1	ต้มผักกาดต้น	79
	2	น้ำพริกมะเขือเทศ	69
	3	ต้มยอดฟักทอง	59
	4	น้ำพริกถั่วเน่า	58
	5	ยำผักกาดดอก	57
	6	น้ำพริกแห้ง	52
	7	ต้มผักกาดดอก	51
	8	แอ๊บปลา	47
	9	ตำมะเขือยาว	45
	9	หมูทอด	45
ข้าว/แป้ง	1	ข้าวเจ้า	236
	2	ฟักทอง	62
	3	มันฝรั่ง	57
	4	ก๋วยเตี๋ยวเส้นใหญ่	56
	5	ก๋วยเตี๋ยวเส้นเล็ก	45

Table A-2 Most frequently consumed of food groups among Lahu tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
ผัก	1	มะเขือเทศ	129
	2	ผักกาดดอก	126
	3	ผักกาดต้น	125
	4	ผักกาดขาว	95
	4	แตงกวา	95
ผลไม้	1	ส้มเขียวหวาน	110
	2	กล้วย	89
	3	ลิ้นจี่	78
	4	มะม่วง (ดิบ)	73
	5	มะม่วง (สุก)	71
เนื้อสัตว์	1	เนื้อหมู	185
	2	ปลาขาว	84
	3	ปลาทราย	77
	4	เนื้อไก่	69
	5	ปลานิล	61
ผลิตภัณฑ์	1	ไข่ไก่	96
จากเนื้อสัตว์	2	ลูกชิ้นหมู	52
	3	ไข่เค็ม	49
	4	แคบหมู	47
	5	ปลาทูเค็ม	41
นม	1	น้ำเต้าหู้	67
	2	โอวัลติน	27
	3	นมถั่วเหลือง ตราแลคตาซอย	26
	4	นมเปรี้ยว ตราดัชมิลล์	22
	5	ไมโล	17

Table A-2 Most frequently consumed of food groups among Lahu tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
น้ำมัน	1	น้ำมันถั่วเหลือง	121
	2	น้ำมันปาล์ม	108
	3	ถั่วลิสง	55
	4	งาขาว	40
	5	น้ำมันหมู	28
เครื่องปรุง	1	เกลือ	166
	2	ผงชูรส	79
	3	น้ำปลา	68
	4	ซีอิ้วขาว	65
	5	ถั่วเน่า	62
ขนมหวาน	1	ขนมปัง	43
	2	ปาท่องโก๋	35
	3	ซาลาเปา	26
	4	ข้าวแต๋น	24
	5	ข้าวหลาม	23

Table A-3 Most frequently consumed of food groups among Tai Yai tribe.

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
เมนูอาหาร	1	แกงผักกาดต้น	90
	2	น้ำพริกหนุ่ม	77
	3	แกงผักกาดดอก	70
	4	ผัดผักกาดดอก	68
	5	น้ำพริกมะเขือเทศ	67
	5	น้ำพริกมะกอก	67
	7	น้ำพริกถั่วเน่า	62
	8	ข้าวซอยน้ำเงี้ยว	61
	9	จอผักกาด	60
	10	ต้มจืด	55

Table A-3 Most frequently consumed of food groups among Tai Yai tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
ข้าว/แป้ง	1	ข้าวเหนียว	131
	2	ข้าวเจ้า	128
	3	ฟักทอง	56
	4	ข้าวโพดสาลี	49
	5	วุ้นเส้น	42
ผัก	1	ผักกาดดอก	92
	2	ผักกาดต้น	88
	3	มะเขือเทศ	87
	4	ผักกาดเขียวปลี	65
	5	ยอดลันเตา	64
ผลไม้	1	ส้มเขียวหวาน	101
	2	กล้วย	80
	3	มะขาม	68
	4	มะละกอสุก	65
	5	พุทรา	54
เนื้อสัตว์	1	เนื้อหมู	133
	2	ปลานิล	74
	3	เนื้อไก่	70
	4	ปลาดุก	48
	5	หอยขม	35
ผลิตภัณฑ์	1	ไข่ไก่	96
จากเนื้อสัตว์	2	แคบหมู	52
	3	หนังปอง	49
	4	ลูกชิ้นหมู	47
	5	ปลาทูเค็ม	41

Table A-3 Most frequently consumed of food groups among Tai Yai tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
นม	1	น้ำเต้าหู้	38
	2	นมถั่วเหลือง ตราแลคตาซอย	29
	3	นมเปรี้ยว ตราดัชมิลล์	23
	4	นมผง ตราแอนลีน	13
	5	โอวัลติน	10
น้ำมัน	1	น้ำมันถั่วเหลือง	73
	2	ถั่วลิสง	62
	3	น้ำมันปาล์ม	41
	4	งาดำ	24
	5	น้ำมันมะพร้าว	19
เครื่องปรุง	1	เกลือ	188
	2	ผงชูรส	184
	3	คะนอร์	54
	4	น้ำปลา	48
	5	ซีอิ้วขาว	42
ขนมหวาน	1	ข้าวแอ๊บ	34
	1	ข้าวควบ	34
	3	ข้าวแต๋น	33
	4	ขนมปัง	26
	5	ข้าวปุก	24

Table A-4 Most frequently consumed of food groups among Haw tribe.

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
เมนูอาหาร	1	ผัดผักกาดดอก	76
	2	ต้มจืด	64
	3	น้ำพริกมะเขือเทศ	54
	4	ต้มผักกาดต้น	34
	5	ปลาทอด	31
	5	ข้าวซอยน้ำเงี้ยว	31
	7	หมูทอด	30
	8	น้ำพริกหนุ่ม	25
	8	ปลานึ่ง	25
	10	น้ำพริกถั่วเน่า	24
ข้าว/แป้ง	1	ข้าวเจ้า	103
	2	ก๋วยเตี๋ยวเส้นใหญ่	34
	3	ฟักทอง	33
	4	เผือก	31
	4	มันฝรั่ง	31
ผัก	1	ผักกาดดอก	64
	2	มะเขือเทศ	60
	3	ผักกาดต้น	51
	4	ผักกาดเขียวปลี	44
	4	ยอดลันเตา	44
ผลไม้	1	ส้มเขียวหวาน	69
	2	กล้วย	55
	3	มังคุด	36
	3	ลองกอง	36
	5	แอปเปิ้ลแดง	35
	5	พุทรา	35

Table A-4 Most frequently consumed of food groups among Haw tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
เนื้อสัตว์	1	เนื้อหมู	81
	2	ปลานิล	41
	3	เนื้อไก่	27
	4	ปลาช่อน	25
	4	ปลาทับทิม	25
ผลิตภัณฑ์	1	ไข่ไก่	44
จากเนื้อสัตว์	2	เต้าหู้ไข่	34
	3	ปลาทูเค็ม	29
	4	แคบหมู	24
	5	หมูยอ	23
นม	1	น้ำเต้าหู้	47
	2	นมถั่วเหลือง ตราแลคตาซอย	26
	3	นมผง ตราแอนลีน	17
	4	นมเปรี้ยว ตราดัชมิลล์	16
	5	นมสด ตราโฟโมสต์	13
น้ำมัน	1	น้ำมันถั่วเหลือง	92
	2	ถั่วลิสง	27
	3	มะม่วงหิมพานต์	23
	4	น้ำมันปาล์ม	16
	5	น้ำมันมะพร้าว	15
เครื่องปรุง	1	เกลือ	108
	1	ผงชูรส	108
	3	ซีอิ้วขาว	70
	4	ซอสหอยนางรม	56
	5	น้ำตาลทรายขาว	37

Table A-4 Most frequently consumed of food groups among Haw tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
ขนมหวาน	1	ขนมปัง	15
	1	ปาท่องโก๋	15
	3	กล้วยบวชชี	14
	3	ข้าวแต๋น	14
	5	ขนมเทียน	13

Table A-5 Most frequently consumed of food groups among Tai Lue tribe.

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
เมนูอาหาร	1	แกงผักกาดต้น	30
	2	น้ำพริกมะเขือเทศ	23
	3	น้ำพริกหนุ่ม	20
	4	น้ำพริกมะกอก	19
	5	น้ำพริกถั่วเน่า	18
	6	แกงแค	17
	6	ผัดผักกาดดอก	17
	8	ข้าวซอยน้ำเงี้ยว	15
	9	ต้มจืด	14
	10	จอผักกาด	13
	10	หมูทอด	13
ข้าว/แป้ง	1	ข้าวเหนียว	38
	2	ข้าวเจ้า	25
	3	ฟักทอง	16
	4	ก๋วยเตี๋ยวเส้นใหญ่	15
	4	ขนมจีน	15
	4	ข้าวโพดสาลี	15

Table A-5 Most frequently consumed of food groups among Tai Lue tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
ผัก	1	มะเขือเทศ	25
	2	ผักกาดต้น	23
	3	ถั่วลันเตา	20
	4	ผักกาดเขียวปลี	19
	4	ยอดลันเตา	18
ผลไม้	1	ส้มเขียวหวาน	25
	2	กล้วย	19
	3	มะขาม	14
	4	พุทรา	12
	4	มะม่วง (สุก)	12
เนื้อสัตว์	1	เนื้อหมู	81
	2	ปลานิล	41
	3	เนื้อไก่	27
	4	กุ้งฝอย	25
	4	ปลาช่อน	25
ผลิตภัณฑ์	1	ไข่ไก่	23
จากเนื้อสัตว์	2	หนังปอง	15
	3	ลูกชิ้นหมู	13
	4	เต้าหู้ไข่	12
	5	แคบหมู	10
นม	1	น้ำเต้าหู้	11
	2	นมถั่วเหลือง ตราแลคตาซอย	7
	3	ไมโล	6
	4	โอวัลติน	4
	4	นมสด ตราโฟโมสต์	4

Table A-5 Most frequently consumed of food groups among Tai Lue tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
น้ำมัน	1	น้ำมันถั่วเหลือง	33
	2	น้ำมันปาล์ม	12
	3	ถั่วลิสง	11
	4	งาดำ	8
	5	งาขาว	5
เครื่องปรุง	1	เกลือ	44
	2	ผงชูรส	40
	3	ซีอิ้วขาว	14
	4	คะนอร์	13
	5	รสดี	10
	5	น้ำปลา	10
ขนมหวาน	1	ข้าวแอ๊บ	9
	2	ข้าวแต๋น	8
	3	ขนมปัง	6
	3	ข้าวควบ	6
	5	ขนมเทียน	5

Table A-6 Most frequently consumed of food groups among Lawa tribe.

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
เมนูอาหาร	1	แกงผักกาดต้น	16
	2	ผัดผักกะหล่ำปลี	14
	3	ปลาทอด	13
	4	ต้มจืด	10
	5	หมูทอด	9
	5	น้ำพริกหนุ่ม	9
	5	น้ำพริกมะเขือเทศ	9
	5	น้ำพริกถั่วเน่า	9

Table A-6 Most frequently consumed of food groups among Lawa tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
เมนูอาหาร	5	ข้าวซอยน้ำเงี้ยว	9
	10	แกงผักกาดดอก	8
ข้าว-แป้ง	1	ข้าวเจ้า	28
	2	ฟักทอง	9
	3	เผือก	8
	4	วุ้นเส้น	7
	4	มันฝรั่ง	7
ผัก	1	ผักกาดดอก	14
	2	แตงกวา	13
	3	ผักกาดต้น	12
	3	ถั่วฝักยาว	12
	3	ถั่วแขก	12
	3	มะเขือเทศ	12
ผลไม้	1	ส้มเขียวหวาน	16
	2	กล้วย	15
	3	มะม่วง (ดิบ)	13
	4	แตงโม	11
	5	มะละกอ (สุก)	10
	5	ฝรั่ง	10
เนื้อสัตว์	1	เนื้อหมู	22
	2	ปลานิล	13
	3	เนื้อไก่	8
	3	ปลาช่อน	8
	5	ปลาดุก	6

Table A-6 Most frequently consumed of food groups among Lawa tribe. **(cont)**

หมวดอาหาร	ลำดับที่	รายการอาหาร	คะแนน
ผลิตภัณฑ์	1	ไข่ไก่	12
จากเนื้อสัตว์	2	ปลาทูเค็ม	11
	3	เต้าหู้ไข่	10
	3	แคบหมู	10
	5	ลูกชิ้นหมู	9
นม	1	นมถั่วเหลือง ตราแลคตาซอย	11
	2	น้ำเต้าหู้	5
	3	นมเปรี้ยว ตราดัชท์มิลล์	4
	4	นมสด ตราโฟโมสต์	3
	5	นมผง ตราแอนลีน	2
น้ำมัน	1	น้ำมันถั่วเหลือง	17
	2	ถั่วลิสง	10
	3	น้ำมันปาล์ม	8
	4	เม็ดมะม่วงหิมพานต์	6
	5	งาขาว	4
เครื่องปรุง	1	เกลือ	28
	1	ผงชูรส	28
	3	ซีอิ้วขาว	16
	4	น้ำปลา	13
	5	ซอสหอยนางรม	8
ขนมหวาน	1	ขนมปัง	7
	2	ข้าวแอ๊บ	6
	3	ข้าวเหนียวดำเปียก	4
	3	เต้าส่วน	4
	5	ขนมหม้อแกง	3

APPENDIX C

Nutritive Value of the Most Commonly Consumed Local Food Items (1 people)

1) Chinese cabbage curry (แกงผักกาดต้น)

Ingredients:	Chinese cabbage	60 g
	Pork bone	53 g
	Chili pepper	1.4 g
	Fermented soybean	1.8 g
	Garlic	2.5 g
	Ginger	2 g
	Water	175 g
	Salt	1.7 g
	Monosodium glutamate	0.5 g

Nutritive value per 1 people:

Energy (kcal)	Fat (g)	Cholesterol (g)	Na (mg)	K (mg)	Ca (mg)	Fiber (mg)
129.99	7.80	23.50	843.35	276.01	77.97	1.48

2) Tomato chili paste (น้ำพริกมะเขือเทศ)

Ingredients:		
	Tomato	32 g
	Chili pepper	3.5 g
	Garlic	3 g
	Coriander	2.8 g
	Shallot	3 g
	Salt	0.8 g
	Monosodium glutamate	0.5 g

Nutritive value per 1 people:

Energy (kcal)	Fat (g)	Cholesterol (g)	Na (mg)	K (mg)	Ca (mg)	Fiber (mg)
15.63	0.15	0	380.04	109.41	7.95	0.93

3) Flower Chinese cabbage curry (แกงผักกาดดอก)

Ingredients:	Flower Chinese cabbage	57	g
	Pork bone	50	g
	Chili pepper	1.3	g
	Fermented soybean	1.5	g
	Garlic	3	g
	Water	185	g
	Salt	2	g
	Monosodium glutamate	0.5	g

Nutritive value per 1 people:

Energy (kcal)	Fat (g)	Cholesterol (g)	Na (mg)	K (mg)	Ca (mg)	Fiber (mg)
129.59	7.91	23.50	894.85	140.13	26.11	0.21

4) Dried fermented soybean chili paste (น้ำพริกถั่วเน่า)

Ingredients:	Fermented soybean	5 g
	Bulbs shallot	6.5 g
	Shallot	3 g
	Chili pepper	19 g
	Garlic	3.5 g
	Coriander	2.8 g
	Salt	2 g
	Monosodium glutamate	0.5 g

Nutritive value per 1 people:

Energy (kcal)	Fat (g)	Cholesterol (g)	Na (mg)	K (mg)	Ca (mg)	Fiber (mg)
37.22	0.93	0	352.12	54.05	21.50	1.20

5) Num-Ngyo with noodle (ข้าวซอยน้ำเงี้ยว)

Ingredients:	Big size rice noodles	1	cup
	Pork	50	g
	Pork bone	83	g
	Tomato	42	g
	Fermented soybean	2.5	g
	Bulbs shallot	54	g
	Shallot	1	g
	Chili pepper	3.5	g
	Coriander	1	g
	Garlic	6	g
	Mungbean sprout	½	cup
	Dried flower red kapok	8	g
	Pig's blood	6	g
	Soybean oil	17	g
	Salt	4	g
	Monosodium glutamate	1.6	g
	Seasoning (Ros-dee)	2	g

Nutritive value per 1 people:

Energy (kcal)	Fat (g)	Cholesterol (g)	Na (mg)	K (mg)	Ca (mg)	Fiber (mg)
690.86	37.39	59.65	2520.25	658.64	87.21	3.27

6) White Chinese cabbage soup (แกงจืดผักกาดขาว)

Ingredients:	White Chinese cabbage	33	g
	Pork	23	g
	Mungbean noodle	23	g
	Egg tofu	7	g
	Garlic	2.2	g
	Ginger	3	g
	Salt	1.2	g
	Monosodium glutamate	0.4	g
	Seasoning (Ros-dee)	1	g
	Water	170	g

Nutritive value per 1 people:

Energy (kcal)	Fat (g)	Cholesterol (g)	Na (mg)	K (mg)	Ca (mg)	Fiber (mg)
149.81	4.22	19.30	764.32	186.62	34.83	1.88

7) Green chili Dip, Northern style (น้ำพริกหนุ่ม)

Ingredients:	Chili pepper	17	g
	Bulbs shallot	7	g
	Shallot	3.5	g
	Garlic	4	g
	Coriander	3	g
	Salt	0.8	g
	Monosodium glutamate	0.4	g

Nutritive value per 1 people:

Energy (kcal)	Fat (g)	Cholesterol (g)	Na (mg)	K (mg)	Ca (mg)	Fiber (mg)
16.90	0.076	0	364.52	59.80	7.57	1.18

8) Fried pork (หมูทอด)

Ingredients:		
	Pork	76 g
	Garlic	2.6 g
	Pepper	0.6 g
	Soybean oil	20 g
	Salt	1 g
	Monosodium glutamate	0.4 g

Nutritive value per 1 people:

Energy (kcal)	**Fat (g)**	**Cholesterol (g)**	**Na (mg)**	**K (mg)**	**Ca (mg)**	**Fiber (mg)**
257.18	20.63	28.12	514.53	303.83	8.29	0.28

9) Nile tilapia soup (ต้มปลานิล)

Ingredients:	Nile tilapia	100	g
	Tomato	20	g
	Chili pepper	4	g
	Galangal	6	g
	Lemon grass	6	g
	Leech lime leaves	1	g
	Fennel common leaves	3	g
	Coriander	4	g
	Lime juice	8	g
	Salt	2.8	g
	Monosodium glutamate	0.5	g
	Water	170	g

Nutritive value per 1 people:

Energy (kcal)	Fat (g)	Cholesterol (g)	Na (mg)	K (mg)	Ca (mg)	Fiber (mg)
106.45	1.35	58.00	1252.25	426.26	73.39	0.63

10) Fried Nile tilapia (ปลานิลทอด)

Ingredients:	Nile tilapia	100	g
	Chili pepper	4	g
	Garlic	3.5	g
	Salt	2.8	g
	Monosodium glutamate	0.5	g
	Soybean oil	25	g

Nutritive value per 1 people:

Energy (kcal)	Fat (g)	Cholesterol (g)	Na (mg)	K (mg)	Ca (mg)	Fiber (mg)
106.45	1.35	58.00	1252.25	426.26	73.39	0.63

APPENDIX D

Table A-7 Name of village located in Doi Tung development project area, Mae Fah Luang district and Mae Sai district, Chiang Rai

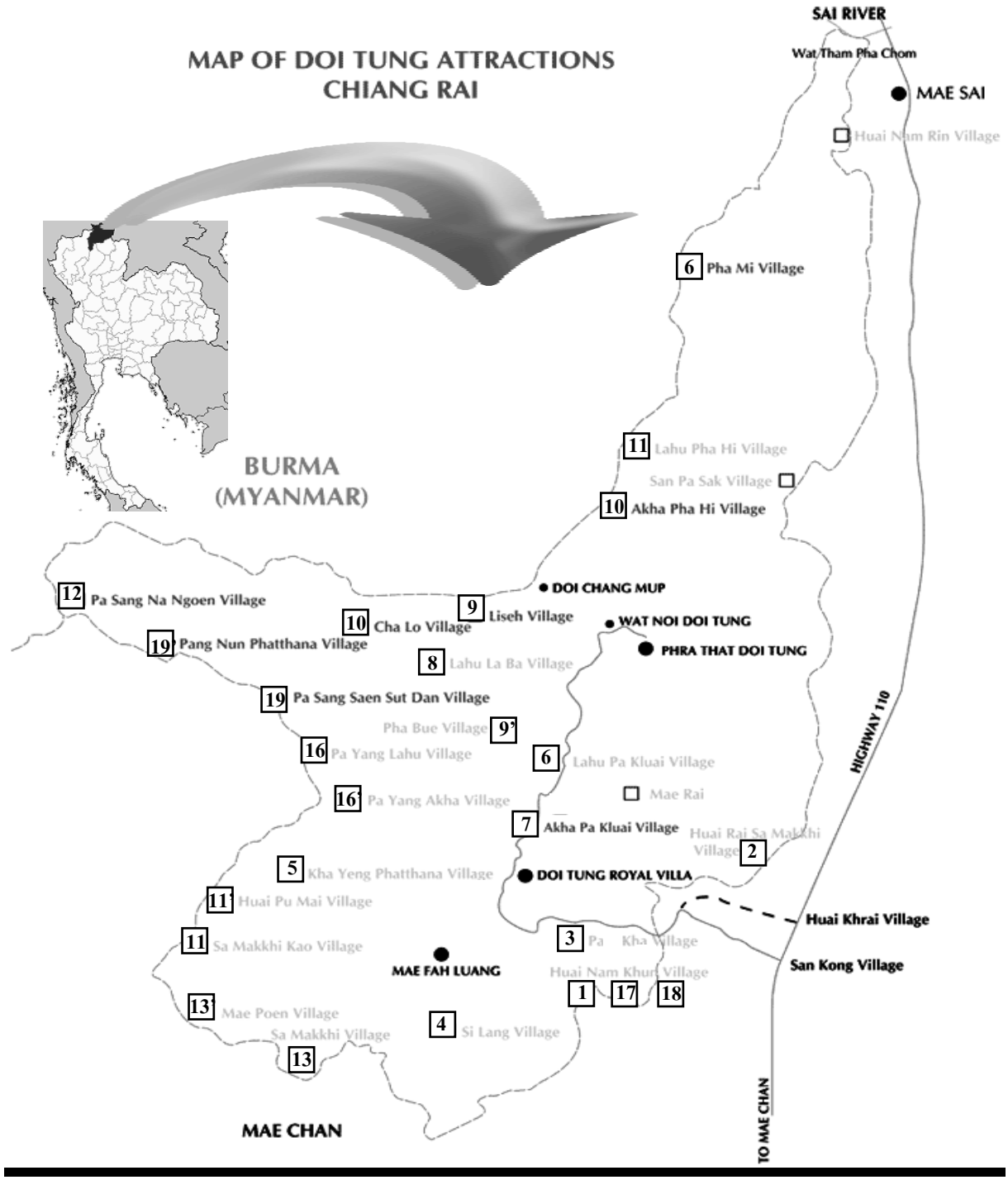
district / Health Center	No.	Village	
Mae Fah Luang district			
Huai Num Khun health center	1	บ้านห้วยน้ำขุ่น	Huai Nam Khun
	2	บ้านห้วยไร่สามัคคี	Huai Rai Sa Makkhi
	15	บ้านปางพระราชทาน	Pang Pra Ratchatan
	17	บ้านห้วยน้ำขุ่น	Huai Nam Khun
	18	บ้านห้วยน้ำขุ่น	Huai Nam Khun
Doi Tung health center	3	บ้านอาข่าป่าคา	Akha Pakha
	4	บ้านอาข่าสี่หลัง	Akha Si Lang
	5	บ้านขาแหย่งพัฒนา	Kha Yeng Phatthana
	6	บ้านลาหู่ป่ากล้วย	Lahu Pa Kluai
	7	บ้านอาข่าป่ากล้วย	Akha Pa Kluai
	8	บ้านลาบา	Lahu La Ba
	9	บ้านลิเช	Liseh
	9’	บ้านผาบือ (บ้านบริวาร)	Pha Bue
	10	บ้านจะลอ	Cha Lo
	14	บ้านสวนป่า	Suan Pha
Samakkee Mai health center	11	บ้านสามัคคีเก่า	Sa Makkhi Kao
	13	บ้านสามัคคีใหม่	Sa Makkhi Mai
	13’	บ้านแม่เปิน (บ้านบริวาร)	Mae Poen

Table A-7 Name of village located in Doi Tung development project area, Mae Fah Luang district and Mae Sai district, Chiang Rai. (cont.)

district / Health Care Center	No.	Village	
Mae Fah Luang district			
Pa Yang health center	11’	บ้านห้วยปูใหม่ (บ้านบริวาร)	Huai Pu Mai
	12	บ้านป่าซางนาเงิน	Pa Sang Na Ngoen
	16	บ้านป่ายางลาหู่	Pa Yang Lahu
	16’	บ้านป่ายางอาข่า (บ้านบริวาร)	Pa Yang Akha
	19	บ้านป่าซางแสนสุดแดน	Pa Sang Saen Sut Dan
	19’	บ้านปางหนุนพัฒนา (บ้านบริวาร)	Pang Nun Phatthana
Mae Sai district			
Pha Mee health center	6	บ้านผาหมี	Pha Mi
Pha Hee health center	10	บ้านอาข่าผาฮี้	Akha Pha Hi
	11	บ้านลาหู่ผาฮี้	Lahu Pha Hi

Source: Sub-district Administration Organization of Mae Fah Luang district, Chiang Rai

Figure A-1 Map of Doi Tung Development Project Area, Chiang Rai province



APPENDIX E

Figure A-2 Traditional dress in six hill tribe including Akha, Lahu, Tai Yai, Haw, Tai Lue and Lawa

APPENDIX F

Figure A-3 Flow chart of protocol study

Participant who following exclusion criteria was excluded

Explained about study project

Signed inform consent

Anthropometric measurement


Blood pressure measurement


Questionnaire, 24 hours recall and FFQ interviewing



BIOGRAPHY

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