ALCOHOL CONSUMPTION RELATED TO ESSENTIAL HYPERTENSION IN NAN PROVINCE

KASET PATI

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Thesis
Entitled

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ALCOHOL CONSUMPTION RELATED TO ESSENTIAL HYPERTENSION IN NAN PROVINCE

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ABSTRACT

This study was a hospital-based case-control study, which was set up to determine the relationship between alcohol consumption and essential hypertension. Data were collected by using structured questionnaires and some data was copied from the patients' medical record (OPD card). Subjects were 151 hypertensive patients who received treatment and 151 healthy subjects who came for an annual physical check-up or were general patients at the Out Patient department of Pua hospital, Nan Province, Thailand, during October 2002 to February 2003. For each case, a control was selected and matched by sex and age (within 5 years).

Multiple logistic regression analysis of alcohol consumption related to essential hypertension by controlling conventional confounders showed that the factors significantly related to essential hypertension were : current drinkers (ORadj=2.27, 95%CI=1.13-4.56), duration of alcohol drinking of 11-20 years (ORadj=2.23, 95%CI=1.01-4.91), drinkers duration of $\geq$ 21 years (ORadj=2.47, 95%CI=1.05-5.84), drinkers who drank 3-4 days / week (ORadj=3.38, 95%CI=1.06-10.79) and drinkers who drank $\geq$ 281 gm / week (ORadj=8.87, 95%CI=2.34-33.59). These factors gave a higher risk of essential hypertension than non drinkers. This model was adjusted for age, Body mass index (BMI), history of essential hypertension in family, salty food, total fiber food, Type A behavior (constant, rushed, activity, aggression and want of accomplishment), smoking and educational level.

For the effect of combination between frequency and quantity of alcohol consumption, drinkers who spent 1 or 2 days per week on a quantity of $\geq$ 280 gm / week (ORadj=5.78, 95%CI=1.11-31.05) and drank 3 or 4 days per week on quantity 281 gm or more (ORadj=15.14, 95%CI=2.18-105.07) had higher risk of essential hypertension than non drinkers. Therefore, the campaign to reduce quantity alcohol consumption is expected to have an effect on reduction of essential hypertension incidence. Excessive alcohol consumption reduction must be considered and promoted by public health organizations or government organizations or non-government organizations.

KEY WORDS : ALCOHOL CONSUMPTION / ESSENTIAL HYPERTENSION

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ความสัมพันธ์ของการดื่มเครื่องดื่มแอลกอฮอล์กับโรคความดันโลหิตสูงชนิดไม่ทราบสาเหตุ ที่จังหวัดน่าน (ALCOHOL CONSUMPTION RELATED TO ESSENTIAL HYPERTENSION IN NAN PROVINCE)

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บทคัดย่อ

การศึกษาแบบย้อนหลัง เพื่อศึกษาความสัมพันธ์ระหว่างการดื่มเครื่องดื่มแอลกอฮอล์กับโรคความดันโลหิตสูงชนิดไม่ทราบสาเหตุ เก็บรวบรวมข้อมูลโดยใช้แบบสัมภาษณ์และจากแบบบันทึกประวัติการรักษา กลุ่มศึกษาได้แก่ ผู้ป่วยโรคความดันโลหิตสูงชนิดไม่ทราบสาเหตุ จำนวน 151 คน เป็นผู้ที่เข้ารับการรักษาที่แผนกผู้ป่วยนอกและกลุ่มควบคุม จำนวน 151 คนซึ่งมีเพศเดียวกันและอายุแตกต่างกันไม่เกิน 5 ปี กับกลุ่มศึกษาจากผู้ที่มาตรวจสุขภาพประจำปีหรือผู้ป่วยทั่วไป ของโรงพยาบาลสมเด็จพระยุพราชปัว จังหวัดน่าน ระหว่างเดือน ตุลาคม พ.ศ.2545 ถึง กุมภาพันธ์ พ.ศ.2546

ผลการวิเคราะห์ข้อมูลเชิงซ้อนโดยการวิเคราะห์ถดถอยพหุแบบลอจิสติก เมื่อควบคุมอิทธิพลของอายุ ดัชนีมวลกาย ประวัติโรคความดันโลหิตสูงของครอบครัว การรับประทานอาหารเค็ม อาหารที่มีเส้นใย บุคลิกภาพชนิดเอ การสูบบุหรี่และระดับการศึกษา พบความสัมพันธ์ของการดื่มกับโรคความดันโลหิตสูงชนิดไม่ทราบสาเหตุได้แก่ ผู้ที่ยังดื่มอยู่ในปัจจุบัน (ORadj=2.27, 95%CI=1.13-4.56), ระยะเวลาที่ดื่ม11-20 ปี (ORadj=2.23, 95%CI=1.01-4.91), ระยะเวลาที่ดื่ม ≥21ปี (ORadj=2.47, 95%CI=1.05-5.84), ผู้ที่ดื่ม3-4วันต่อสัปดาห์ (ORadj=3.38, 95%CI=1.06-10.79)และปริมาณการดื่มขนาด281กรัมของแอลกอฮอล์ขึ้นไปต่อสัปดาห์(ORadj=8.87, 95%CI=2.34-33.59) เสี่ยงต่อการเกิดโรคความดันโลหิตสูงชนิดไม่ทราบสาเหตุมากกว่าผู้ที่ไม่ดื่ม ผลร่วมระหว่างปริมาณและความถี่ของการดื่ม โดยผู้ที่ดื่ม1-2วันต่อสัปดาห์ ในปริมาณ≥281กรัมของแอลกอฮอล์ต่อสัปดาห์(ORadj=5.78, 95%CI=1.11-31.05) และผู้ที่ดื่ม3-4วันต่อสัปดาห์ในปริมาณขนาด281กรัมของแอลกอฮอล์ขึ้นไปต่อสัปดาห์ (ORadj=15.14, 95%CI=2.18-105.07) เสี่ยงต่อการเกิดโรคมากกว่าผู้ที่ไม่ดื่ม

ดังนั้นการรณรงค์เพื่อลดปริมาณการดื่มเครื่องดื่มแอลกอฮอล์ โดยร่วมมือกันทั้งในภาครัฐและภาคเอกชนน่าจะมีผลต่อการลดอุบัติการเกิดโรคความดันโลหิตสูงชนิดไม่ทราบสาเหตุในกลุ่มประชากร

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CHAPTER 1
INTRODUCTION

Rationale and Background

The impact of changing in development on economy, society, culture and lifestyle in various countries resulted in epidemiological transition. The chronic diseases or non–communicable diseases are becoming more common in Thai people.. At the same time, the morbidity and mortality rates from non-communicable disease increase. One of all, cardiovascular disease is a major health problem that is widely found in every region of the world.

In Thailand, cardiovascular disease is one of the major health problems. The cardiovascular morbidity rate has been reported at as an important cause of morbidity for past several years (1). It was ranked second among all causes of death in 1998 (2). In Nan province, hypertension was the fifth among all causes of death as shown in Table 1.

Table 1. Causes of death, verified by verbal autopsy, Thailand and Nan province, 1998.

Mortality rate by 100,000 population			
Thailand		Nan province	
1.Infectious diseases	100.9	1.COPD	86.0
2.Cardiovascular diseases	100.0	2.AIDS	85.7
3. Cancer	94.2	3.Cancer	74.5
4. External cause*	79.2	4.Senility	52.6
5. Lower respiratory tract infection	48.3	5.Hypertension	30.2

* Car accident, murder, suicide, drowning and other accident

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Hypertension, it is a major cause that leads to disability or complications, which are considered as life threatening condition. According to the national health examination survey in Thai population in 1991 and 1996, and some others studies in specific groups, prevalence of hypertension were detected as shown in Table 2.

Table 2. Prevalence of hypertension in Thai population.

Year of study	Researcher and criteria	Place	No. of subjects	Age	Prevale-nce rate(%)
1978	Leelarassamee et al*(3)	-Bankok	3791	10-65	8.9
1989	Sitthi-Amorn et al.(4)	-Klong Toey	976	≥30	17.3
	(≥160/95)	-Government apartment houses	909	≥30	14.0
1991	NHES I (5)	Whole	1606	15-59	5.4
	(≥160/95)	Country	1313	over 60	13.4
1995	Wongdyan Pandii *(6)	Govt. bank	1860	20-65	16.5
1996	NHES II *(7)	Whole	4230	13-59	11.6
		Country	4048	over 60	27.1
1999	Rangsan Voravong*(8)	Chingmai	199	over 60	47.2
1999	Whitaya et al *(9)	-Tak (Thai-yais)	488	over 40	24.2
		Thai-communities	812	over 40	15.6

* Criteria at SBP/DBP ≥ 140/90

The National health examination survey(NHES) in Thai population in 1991 and 1996 has shown the proportion of unawared and uncontrolled cases of hypertensive patients. The data is shown in Table 3.

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Table 3. Proportion of unawared hypertension and uncontrolled cases of hypertension in Thai population.(7)

Researcher	Number of subjects	Age	Unawared cases (% of all hypertensive)	Uncontrolled cases * (% of awared cases)
NHES I	2919	Over 15	89.7	56.1
NHES II	4048	Over 60	52.8	50.8

* awared but untreated + treated but uncontrolled.

According to the annual report of hypertension patients from Pua hospital in Nan province in 2001 (10). It was found that morbidity rate was 3268.68 per 100,000 population. There were 1863 hypertensive patients visiting the hypertension clinic of Pua hospital.

There are many previous studies about risk factors to essential hypertension. These studies reported that essential hypertension was associated with age, sex, family history of hypertension, excess body weight, smoking, alcohol consumption, salt intake, pattern of food, physical activity, and stress(11). In Thailand, only a few studies were concerned with the risk factors to essential hypertension. There are few studies for the determination of association of alcohol consumption and essential hypertension. There is not clear for association. Most of Thai people prefer to drink alcoholic beverage. It is estimated that 33% of Thai people have consumed some form of alcoholic beverage (7).

The researcher aims to study association between alcohol consumption on essential hypertension and risk factors related to essential hypertension. The results from this study will provide better control and prevention of hypertension.

General Objective

To study the associations between of alcohol consumption and essential hypertension.

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Specific Objectives

To study the associations between status, duration, frequency and quantity of alcohol consumption on essential hypertension.

Research Hypothesis

Alcohol drinker have a higher risk of essential hypertension than non-drinker.

Variables

1.Independent variables : Alcohol consumption

(status, duration, frequency and quantity)

2.Dependent variable : Essential hypertension

(Essential HT, non - essential HT)

3.External variables :

1. Heredity
2. Body Mass Index (BMI)
3. Physical activity
4. Smoking
5. Salty food
6. High fat food
7. Fiber foods
8. Type A behavior
9. Total cholesterol

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Definition of Terms

1. Case

Patients were first diagnosed with essential hypertension by the physician and / or received treatment at Hypertension Clinic of Pua hospital in Nan province between January 1 and September 30, 2002. All cases have aged 30-60 years old.

2. Control

Patients were diagnosed with any other disease without any hypertension condition by the physician at Out Patient Department of Pua hospital. Controls were matched for sex and age of cases.

3. Blood pressure

Blood pressure is determined by the amount of blood pumped by the heart, and the size and condition of the arteries. Blood pressure is measured in millimeters of mercury, which is abbreviated mm Hg. (12) The measurement of blood pressure of the patients were :

- Being in the rest state at least 5 minutes before the measurement with no alcohol intake, caffeine and exercise
- Measuring on the left arm and sitting position.
- Using a mercury sphygmomanometer

Systolic blood pressure

Systolic blood pressure is defined as the "top" number, which represents the pressure generated when the heart beats as the first Korotkoff sounds phase I or the pressure when the first sound is heard.

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Diastolic blood pressure

Diastolic blood pressure is defined as the "bottom" number, which represents the pressure in the vessels when the heart is at rest as the fifth Korotkoff sounds phase V disappear or the pressure when the last sound is heard.

4. Hypertension

The hypertension patients, based on JNC VI(13), are the patients who have systolic blood pressure of 140 mmHg or higher and diastolic blood pressure of 90 mmHg or higher.

5. Essential hypertension patients

Essential, primary or idiopathic hypertension has no identifiable cause. The causes of these hypertension are not renal diseases, diabetic mellitus, heart disease, endocrine system disorder, use of medications, drugs, or other chemicals (hormonal contraceptives, licorice and carbenoxolone, ACTH and coerticosteroid), pregnancy and organic diseases (Adrenal gland tumors, Cushing's syndrome, kidney disorders, hemolytic-uremic syndrome, periarteritis nodosa, radiation enteritis, retroperitoneal fibrosis, Wilms' tumor)

6. Alcohol consumption

Alcohol is defined as ethyl alcohol (ethanol), is produced by fermenting the starch or sugar in various fruits and grains. Alcoholic beverages produced by fermentation and distillation include beer (usually about 5% to 8 % alcohol), wine (usually 12% to 15% alcohol), and distilled liquors such as whisky, brandy, mixed liquor of Thai and local liquor, which might be made by licensed industries, or local liquor made by local people.

In calculating the amount of alcohol consumed (in grams per day), it is conversion into gram of alcohol that 5 oz or about 150 ml (1 oz = 29.57 ml) of wine (14%alcohol) contain 21 g, 5 oz or about 150 ml of beer (6%alcohol) contain 9 g,

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1 oz of mixed liquor of Thai and local liquor (35%alcohol) contain 10.5 g of ethanol and 1 oz of whisky or brandy (42%alcohol) contain 12.2 g of ethanol. These are types of alcoholic drink in Nan population. Alcohol consumption is categorized as : non, 1-140, 141-280 and more than or equal 281 gram per week of ethanol.(14)

Non- drinker mean person who never drank alcohol beverage and / or who had drank < 24 time per year.

Ex – drinker mean person who drank alcohol beverage previously and had ceased alcohol consumption $\geq$ 1 year before diagnosis.

Current – drinker mean person who drank alcohol beverage in current or previously and had ceased alcohol consumption < 1 year before diagnosis.

7. Body Mass Index (BMI)

Body Mass Index is defined as the measurement indicating obesity level. Height was measured in centimeters while the participant stood without shoes, and weight was measured in kilograms while the participant stood without shoes and in light clothing. BMI was calculated as weight in kilograms over height in meter squared. It is expressed as follow :

$$BMI = \frac{Wt\ (kg.)}{Ht^2\ (meter)^2}$$

To interpret BMI (WHO, 2000) (15)

Under weight	< 18.5	kg/m^2
Normal	18.5 – 22.9	kg/m^2 *
Over	$\geq$ 23	kg/m^2

* category which is used as the referent category.

8. Smoking

Smokers are subjects who smokes cigarettes, cigars and non filter cigarettes. Smoking are classifieds as follow : (16)

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Non- smoker: any person that has never smoked .

Ex - smoker : smoker who had stopped smoking ≥ 1 years before diagnosis.

Current- smoker : any person who smoked a tobacco product at the time of study or smoker who had ceased smoked < 1 year before diagnosis.

9. Physical activity

Physical activity can be defined as bodily movements produced by the contraction of skeletal muscles that expend energy above the base level. Common types include occupational, household, leisure time (competitive exercise, recreational sports), or travel activities. (17)

Exercise is defined as body exercise such as jogging, bicycling, swimming or other activities that move the body continuously for at least 30 minutes and at least three days per week. It is measured by three items in terms of type of exercise, frequency and duration per time. Three categorized are used never, 1-2 /week, and 3 or more / week.

10. Heredity

Heredity is defined family history of hypertension of first – degree relative (parents, siblings, and offspring)

11. Salty food (18)

Salty food is defined salt intake such sodium chloride, fish sauce or salty food in each day. Salty food is measured as how often the patient adds salt or fish sauce to prepared food before eating, or how often they have high salty food by time per week.

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12. Fat-rich- food (19)

Fat-rich- food is defined as food item that have high cholesterol and / or high fat . Fatty food includes egg, giblet, animal brain, seafood, deep fried foods, creamy food and rich fatty meat. It is measured that how often they have high fat food using times per week.

13. Total fiber food (18)

Total fiber food is defined as food with total fiber, usually from fruit, vegetable and whole-grain cereals. It is measured that how often they have total fiber food (times per week.)

14. Food pattern

Food pattern is defined as habitual food during the past year. It is assessed by a food frequency questionnaire (FFQ) (20) (21) that consists of food items in 3 food groups (salty food, high fatty food and total fiber food) and intake frequency (per week). Three category are used : low, medium and high per week. Pooled mean were used in this study.

- High ; $\geq$ mean + standard deviation (SD)
- Medium ; mean interval between high and low
- Low ; $\leq$ mean - standard deviation (SD)

The cut off point were shown in the Appendix.

15. Type A behavior

Type A behavior is defined as a behavioral sense of style characterized by excess of competitiveness, striving for achievement, aggressiveness, and time urgency. In this study, Type A behavior is measured by The Framingham Type A Scale (22) (23). It contains 10 questions, including questions for both employed

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persons and housewives. Type A persons are defined as persons who had score higher than 50 percent

.

16. Total cholesterol (TC)

Hypercholesterolemia (19) is defined as a serum cholesterol concentration of 200 mg / 100 ml or more. Total cholesterol are classifications as follow:

Total cholesterol	< 200 mg/dl	Desirable blood cholesterol
	200-239	Borderline high blood cholesterol
	≥ 240	High blood cholesterol

Benefit of the study

To provide guidelines with the result for the management of hypertension in Pua districts and near by districts or Nan province on alcohol consumption and other behavioral factors.

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CHAPTER 2
LITERATURE REVIEW

This chapter provides the literature covering essential hypertension, alcohol beverage and relevant risk factors research findings.

Part 1 : Information about essential hypertension.
Part 2 : Information about alcohol beverage.
Part 3 : Review of relevant risk factors.

Part 1 : Information about essential hypertension.

Blood pressure (24)

Blood pressure is defined as arterial blood pressure. Blood pressure have two indicators ; generally this includes systolic blood pressure (SBP), the "top" number, which represents the pressure generated when the heart beats and diastolic blood pressure (DBP) the "bottom" number, which represents the pressure in the vessels when the heart is at rest. Blood pressure is determined by the amount of blood pumped by the heart, and the size and condition of the arteries. Many other factors can affect blood pressure, including volume of water in the body ; salt content of the body ; condition of the kidneys, nervous system, or blood vessels ; and levels of various hormones in the body. Determinants of aortic pressure, if the cardiac output (CO) is the ratio of the driving pressure (ΔP) and the total peripheral resistance (TPR) and if we assume the vena caval pressure is approximately zero, than ΔP become the mean aortic pressure (MAP) then,

$$MAP = CO \times TPR$$

If the remaining factor is held constant, an increase or decrease in either cardiac output or total peripheral resistance will result in a corresponding increase or

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decrease in mean aortic pressure. Cardiac output may, in turn, be altered either by a change in heart rate or stroke volume, so that change in either of these factors may affect MAP depending on the net effect on cardiac output.

The pathophysiology of hypertension

There is still much uncertainty about the pathophysiology of hypertension**.** However, no clear single identifiable cause is found and their condition is called"essential hypertension". A number of physiological mechanisms are involved in the maintenance of normal blood pressure, and their derangement may play a part in the development of essential hypertension**.**

It is probable that a great many interrelated factors contribute to the raised blood pressure in hypertensive patients, and their relative roles may differ between individuals. Among the factors that have been intensively studied are salt intake, obesity and insulin resistance, the renin-angiotensin system, and the sympathetic nervous system. In the past few years, other factors have been evaluated, including genetics, endothelial dysfunction (as manifested by changes in endothelia and nitric oxide), low birth weight and intrauterine nutrition, and neurovascular anomalies.

The pressure required to move blood through the circulatory bed is provided by the pumping action of heart (cardiac output) and the tone of the arteries (peripheral resistance). Each of these primary determinants of blood pressure is, in turn, determined by interaction of the exceedingly complex series of factors displayed in Figure 1. (15)

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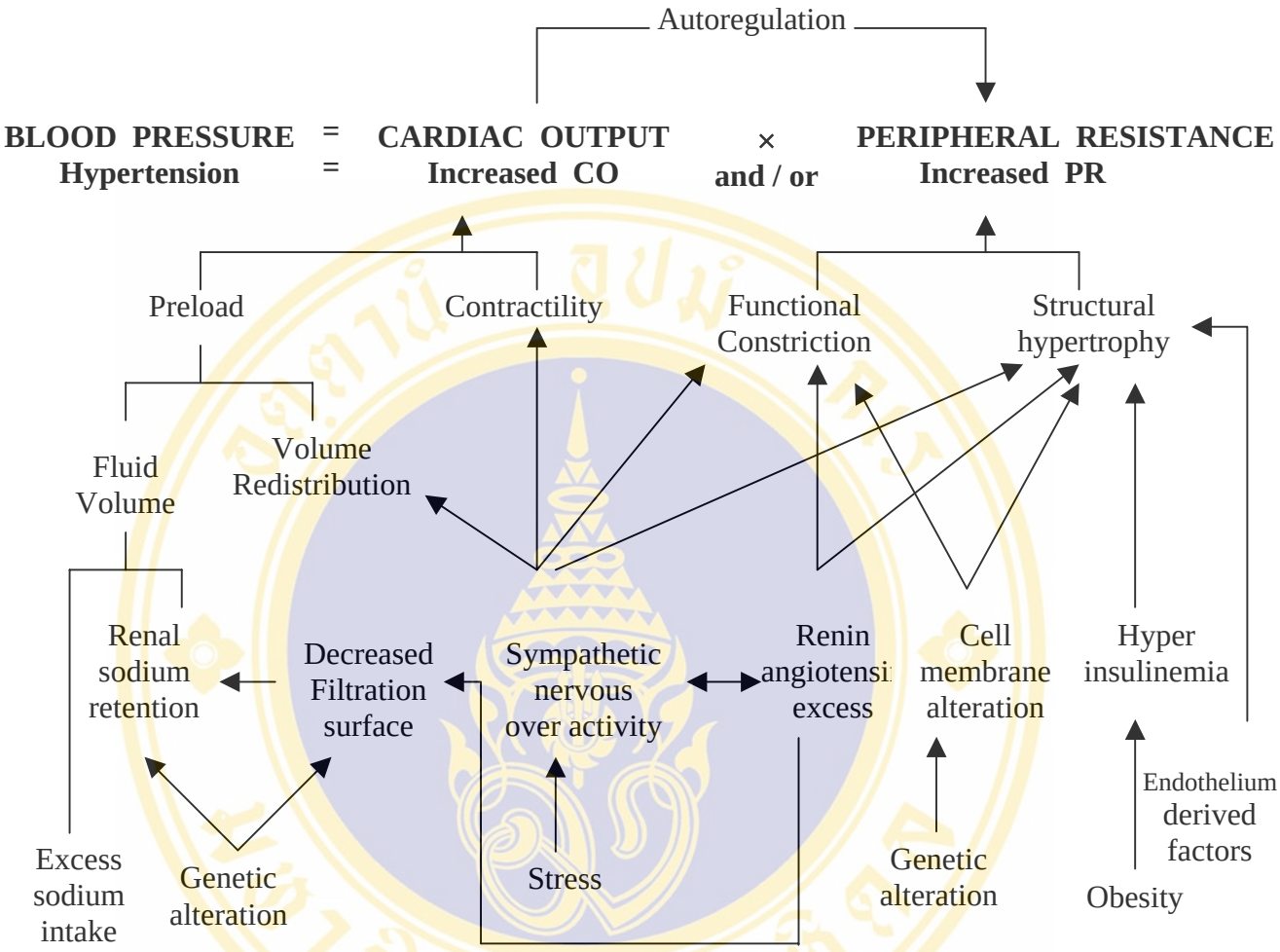

Figure 1. Some of factors involved in the control of blood press that affect the basic equation : Blood pressure = cardiac output × peripheral resistance. (27)

Definition and classification of hypertension

The purpose of a classification of hypertension is to provide an easy and reliable method for characterization of each patient. It allows assessment of severity of disease by reference to epidemiological data so that risk can be defined and appropriate treatment instituted.

Arterial hypertension may be classified in three separate ways by blood pressure level, by the extent of damage to organs, and by etiology. (26)

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1. Classification by level of blood pressure

The definition of hypertension have contributed to the variation in the definitions issued by various national and international authorities and particularly by the Joint National Committee in the USA and the WHO-ISH Guidelines Committee. (27) The WHO-ISH Guidelines Committee has agreed to adopt in principle the definition and classification provided in JNC VI. This new definition defines the lower limits of hypertension as 140 mmHg systolic and 90 mmHg diastolic, the same as the lower limits for the "borderline sub group" of mild hypertension in the 1997 WHO-ISH Guidelines.

Hypertension is therefore defined as a systolic blood pressure of 140 mmHg or greater and/or a diastolic blood pressure of 90 mmHg or greater in subjects who are not taking antihypertensive medication. A classification of blood pressure levels in adults over the age of 18 is provided in Table 4. The terms "Grade" 1, 2 and 3 have been chosen rather than the terms "Stage" 1, 2 and 3 used by JNC VI, since the word "stage" implies progression over time in a way that does not necessarily apply here. Otherwise, the values chosen and the terms used are those used in JNC VI. The terms "mild", "moderate" and "severe" used in previous versions of the WHO-ISH Guidelines, would correspond to Grades 1, 2 and 3, respectively. The widely used term "borderline hypertension", becomes a subgroup within Grade 1 hypertension. It must be emphasis that the term "mild hypertension" does not imply a uniformly benign prognosis, but is used simply to contrast with more severe elevations of blood pressure.

Table 4. Definitions and Classification of Blood Pressure Levels, WHO. (27)

Category	Systolic (mmHg)	Diastolic (mmHg)
Optimal	<120	<80
Normal	<130	<85
High – Normal	130-139	85-89
Grade 1 Hypertension ("mild")	140-159	90-99
Subgroup: Borderline	140-149	90-94
Grade 2 Hypertension ("moderate")	160-179	100-109

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Table 4 (continued)

Category	Systolic (mmHg)	Diastolic (mmHg)
Grade 3 Hypertension ("severe")	180	≥ 110
Isolated Systolic Hypertension	≥ 140	<90
Subgroup: Borderline	140-149	<90

The classification of blood pressure for adults aged 18 and older shown in the table is intended to give an indication of the degree of risk associated with different levels of blood pressure.

Table 5. Classification of Blood Pressure Levels for Adult aged 18 years and older. JNC VI(13)

Category	Systolic (mmHg)		Diastolic (mmHg)
Optimal	<120	and	<80
Normal	<130	and	<85
High – Normal	130-139	or	85-89
Hypertension			
Stage 1	140-159	or	90-99
Stage 2	160-179	or	100-109
Stage 3	≥ 180	or	≥ 110

2. Classification by etiology or cause (28)

In 90 to 95 percent of high blood pressure cases, the cause is unknown. When the cause is unknown, the condition are called essential or primary hypertension.

2.1 Essential hypertension

Essential, primary or idiopathic hypertension has no identifiable cause. It may have genetic factors and environmental factors, such as salt intake or others. Essential hypertension comprises over 95% of all hypertension.

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2.2 Secondary hypertension

Factors that may lead to high blood pressure in the remaining 5-10 percent of cases, which are known as secondary hypertension, Secondary hypertension is hypertension caused by another disorder. This may include:

1.Use of medications, drugs, or other chemicals (hormonal contraceptives, licorice and carbenoxolone, ACTH and coerticosteroid)

2.Pregnancy

3.Organic disease (Adrenal gland tumors, Cushing's syndrome, kidney disorders, hemolytic-uremic syndrome, periarteritis nodosa, radiation enteritis, retroperitoneal fibrosis, Wilms' tumor

3. Classification by the stage of organ damage

Stage I : No manifestation of organ change

Stage II : At least one of the following manifestation of organ involvement

- Left ventricular hypertrophy on physical examination, X-ray, ECC, etc.
- Generalized and focal narrowing of retinal arteries.
- Proteinuria and /or slight elevation of plasma creatinine concentration.

Stage III : Both symptoms and signs have appeared as a result of organ damage to various organs from hypertensive disease. These include :

Heart : left ventricular failure

Brain : hypertensive encephalopathy

Optic fundi : hypertensive retinopathy

Other conditions frequently present in stage III but less clearly a direct consequence of hypertension include :

Heart : myocardial infraction, angina pectoris.

Brain : intracranial arterial thrombosis.

Vessels : dissecting aneurysm

Kidney : renal failure

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Complications of hypertension (29)

Complications associated with blood pressure elevation fall into the following categories

1.Heart : heart attacks, congestive heart failure

2.Brain : stroke, brain damage

3.Kidney : kidney failure, kidney damage

4.Vascular : blood vessel damage (arteriosclerosis), aortic dissection

5.Retina : loss of vision

Essential hypertension : Natural history

A model of the natural history of essential hypertension is presented in figure 2. (25)

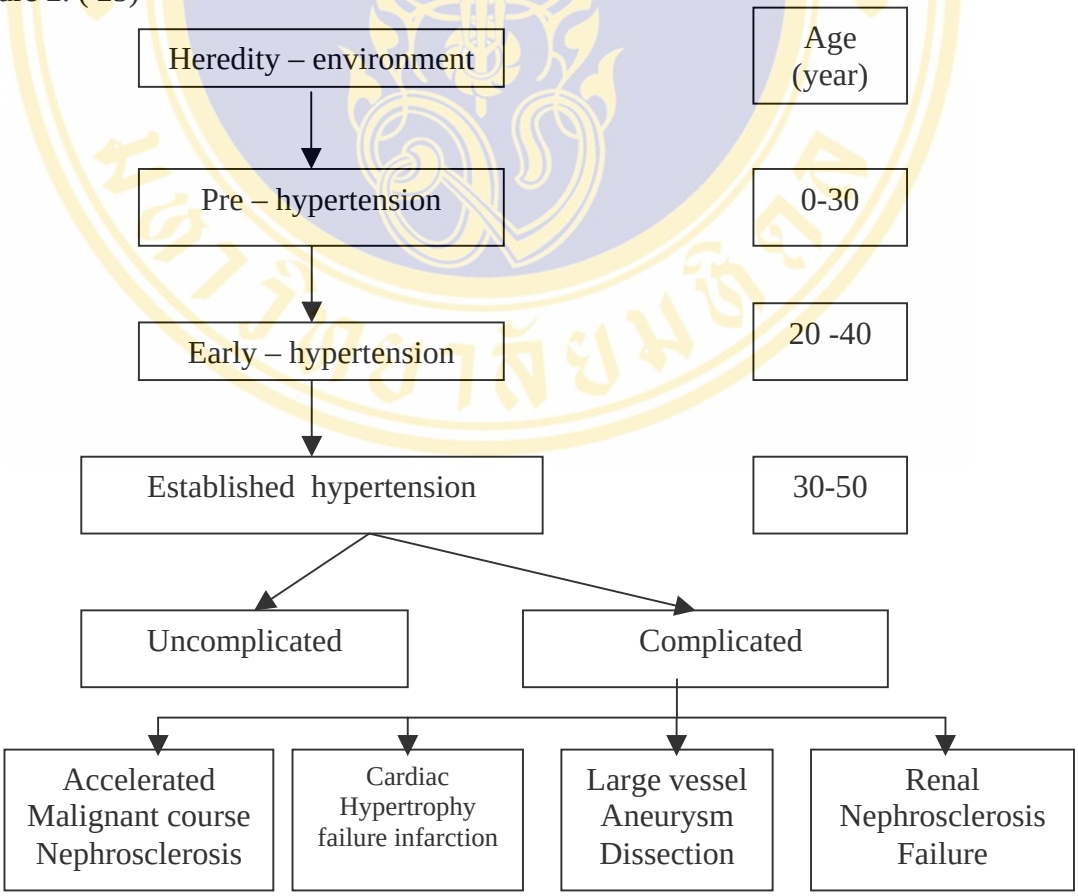

Figure 2. Representation of the natural history of untreated essential hypertension.

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Part 2 : Information about alcohol beverage.

Alcoholic beverage

Alcoholic beverage is liquid that contains alcohol (ethanol) and is intended for drinking. Almost all alcoholic beverages are produced by fermentation and distillation.

Ethanol or ethyl alcohol results from the fermentation of sugar by yeast(Zymase). Under usual conditions, beverages produced by fermenting the starch or sugar in various fruits and grains (30).

$C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 2C_2H_5OH+2CO_2$

Beer is produced from fermented grain (malted barley, rice) often with hops added and usually contains bout 6% alcohol. Wines are produced from fermented fruits or berries, particularly grapes and usually contains 12 to 15% alcohol. Hard liquor is produced by fermentation and distillation and which is about 35 to 45 % alcohol, for example whisky, brandy, Maekong, Hongthong and home production in Thailand (local liqour) and may be contaminated with poisons from the production process.(31)

Table 6. Concentration of alcohol by trade name of alcohol beverage in Thailand.

Type of alcohol beverage	Trade name	Alc % vol. (degree)
1.Beer	Charng	6.5
	Leo	5.0
	Singha	6.0
2.Wine		14
3.Liquor	Maekhong	35
	Hongthong, Hongthai	35
	Sangshom	40
	Regency	38
	Chivas	43
4.Local liquor (home product)		35

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The metabolic process (32)

When alcohol is consumed, it is absorbed quickly through the stomach and the gastrointestinal tract. No digestion is required. Absorption rates for alcohol depend on the amount and type of food in the stomach (for example, high protein and high fat foods decrease absorption rates) and whether or not the beverage is carbonated or effervescent (both of which increase absorption rates).

The effects of alcohol may appear within 10 minutes after consumption and peak at approximately 40 to 60 minutes. Alcohol remains in the bloodstream until it is broken down by the liver. If an individual consumes alcohol at a faster rate than it can be broken down by the liver, the blood alcohol concentration level rises.

Most states have standards establishing legal limits for alcohol intoxication at 0.08 to 0.10% (grams of alcohol per 100 milliliters of blood). Most individuals report feeling "high" at 0.05% blood alcohol level, while a level of 0.20% is associated with marked intoxication. At the 0.30% level, one may become stuporous or even comatose, and death has been associated with blood alcohol levels of 0.35% and above.

As a central nervous system (CNS) depressant, alcohol depresses the respiratory (breathing) rate, heart rate, and the control mechanisms in the brain. The effects of such CNS depression may include:

- impaired ability to perform complex tasks (such as driving)
- reduction of inhibitions, embarrassment and anxiety
- decreased attention span
- impaired short term memory
- impaired motor coordination

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Part 3 : Review of relevant risk factors.

Now that the possible causes of essential hypertension have been considered in many literature.

1.Alcohol consumption

The National Examination Health Survey in Thailand showed prevalence of Alcohol consumption as follow:

Table 7. Prevalence of alcohol consumption, National Examination Health Survey in Thailand (5) (7)

National Health Examination Survey (NHES)	Prevalence (%)				
	Total	North	Central	Northeast	South
1993 NHES I age 13–59 years	33.04	42.07	30.95	37.70	21.80
1998 NHES II age 15–59 years	33.67	42.90	28.84	39.48	24.65

Nakanishi et al. (33) had studied alcohol consumption and risk for hypertension in middle aged Japanese men using longitudinal study from 1990 to 1999. After controlling for potential predictors of hypertension, the relative risk for hypertension compared with non-drinkers was 1.52 (95% CI, 1.05-2.19) for persons who drank 0.1 – 22.9 g/day of ethanol, 1.81 (95%CI, 1.29-2.54) for persons who drank 23 – 45.9 g/day of ethanol, 2.12 (95% CI, 1.53-2.94) for persons who drank 46 – 68.9 g/day of ethanol and 2.48 (95% CI, 1.75-3.52) for persons who drank more than 68.9 g/day of ethanol (test for trend, $p< 0.001$). The relative risk for hypertension in current drinkers versus non-drinkers was stronger among men with a body mass index (BMI) less than 24.2 kg/m^2 than among men with a BMI 24.2 kg/m^2 or more, although the absolute risk was greater in obese men. The risk for hypertension increased in a dose-dependent manner as alcohol intake increased in middle-aged Japanese men. The increased relative risk for hypertension associated with alcohol was more pronounced in leaner men.

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Fuchs et al. (34) had studied alcohol consumption and the incidence of hypertension. A cohort study was designed to follow-up participants from 1989 to 1995 in The Atherosclerosis Risk In Communities (ARIC) Study in the United States. The objective was to examine the nature of association between consumption of ethanol and the subsequent development of hypertension. There was an increased risk of hypertension in those who consumed large amounts of ethanol ($\geq$ 210 g per week) compared with those who did not consumed alcohol over the 6 years of follow-up. The adjusted odds ratio were 1.2 (95% CI, 0.85-1.67) for white men, 2.02 (95% CI,1.08-3.79) for white women, and 2.31 (95% CI, 1.11-4.86) for black men. At low to moderate level of alcohol consumption (1 to 209 g per week), the adjusted odds ratio (95% confidence interval) were 0.88 (0.71-1.08) for white men, 0.89 (0.73-1.09) for white women , 1.71 (1.11-2.64) for black men and 0.88 (0.59-1.33) for black women. Systolic and diastolic blood pressure were higher in black men who consumed low to moderate amount of alcohol compared with non-consumers but not in the other race-gender strata. Higher levels of consumption of all types of alcohol $\geq$ 210 g per week is an independent risk factor for hypertension in general population of North American population. The consumption of low to moderate amounts of alcohol also appears to be associated with a higher risk of hypertension in black men.

Marques-Vidal et al. (35) had studied different alcohol drinking and blood pressure relationships in France and Northern Ireland.To assess the effect of alcoholic beverages consumed on blood pressure levels by day of the week, baseline data from the Prospective Epidemiological Study of Myocardial infraction (PRIME) was used and participants were followed for 5 years since 1991. In France, alcohol consumption was rather homogeneous throughout the week, with a slight increase during weekends, whereas in Northern Ireland, Fridays and Saturdays accounted for 66 % of total alcohol consumption. After adjustment for potential variables, blood pressure levels were higher in Northern Irish drinkers on Monday and decreased until Thursday, whereas blood pressure levels were constant throughout the week for French drinkers The binge-drinking pattern observed among Northern Irish drinkers leads to physiologically disadvantageous consequences regarding blood pressure

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levels, whereas no such fluctuation in blood pressure levels are found for regular consumption.

Xin et al. (36) had studied effect of alcohol reduction on blood pressure. A meta- analysis of randomized controlled trials to assesses the effect of alcohol reduction on blood pressure, included 15 randomized controlled trials (total of 2234 participants) published between 1966 through June 1999. Overall, alcohol reduction was associated with a significant reduction in mean (95% CI) systolic and diastolic blood pressure of –3.31 mmHg (-2.52 to –4.10 mmHg) and – 2.04 mmHg (-1.49 to –2.58 mmHg), respectively. A dose-response relationship was observed between mean percentage of alcohol reduction and mean blood pressure reduction. Effect of intervention were enhanced in those with higher baseline blood pressure. Alcohol reduction should be recommended as an important component of lifestyle modification for the prevention and treatment of hypertension among heavy drinkers.

Moore et al.(37) had studied alcohol consumption and blood pressure in the 1982 Maryland Hypertension Survey. A cross-sectional population-based household survey of blood pressure control in adults residing in Maryland. Among individuals of less than 50 years old, a J shaped dose-response association was found with abstainers and heavy alcohol consumers having significantly higher blood pressures than moderate alcohol consumers (1 to 2 beverages per day). Among individuals 50 years and older, alcohol was associated with higher blood pressures only at the high levels of intake (greater than 2 beverages per day). This association between alcohol consumption and blood pressure was independent of several variables that are associated with increased blood pressure such as age, sex, race, smoking, education, Quetelet index, social participation, and physical activity. The population attributable risk for hypertension due to heavy alcohol consumption is 5 to 7% in those greater than 50 years old and 6 to 8% in those less than 50 years old. These data suggested that alcohol consumption is a potentially important risk factor for elevations in blood pressure and hypertension.

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Lang et al. (38) had studied relationship between alcohol consumption and hypertension prevalence and control in a French population in a cross-sectional study. This association was highly significant in the multivariate analysis (multiple linear regression) where alcohol intake, following age and body mass index were three predictive factors of blood pressure level in the stepwise regression. The positive association between alcohol consumption and prevalence of arterial hypertension was aggravated by the poor control of hypertension which was found among drinkers. Awareness of hypertension, compliance with an antihypertensive treatment and its efficacy, were negatively associated with alcohol intake. The findings stress the importance of alcohol consumption which was found to be a major risk factor for arterial hypertension and noncompliance with antihypertensive treatment in this population.

Weissfeld et al. (39) had studied sex and age interactions in the association between alcohol and blood pressure in a cross-sectional study. The association between alcohol and blood pressure was examined in a probability sample of Michigan adults surveyed in 1983. Heavy alcohol intake (more than one drink daily) were associated with increased SBP, DBP, and prevalence of elevated blood pressure. These association were somewhat exaggerated in women and in young persons. Statistically significant differences in blood pressure were demonstrated only among consumers of more than one drink daily. Attributable risk calculations indicated that no more than 8.4 and 8.5 % of instances of elevated blood pressure (SBP $\geq$ 90 mmHg) in men and women, respectively, could be attributed to alcohol intakes exceeding one drink daily.

Puddey et al. (40) had studied effects of alcohol and caloric restrictions on blood pressure and serum lipids in overweight men in Western Australia in 1992. The aim was to assess whether a combined approach using both caloric and alcohol restrictions would have potentially additive or synergistic effects in lowering BP in such subjects. A randomized, controlled trial was conducted. Alcohol restriction were associated with decreases in SBP of 4.8 mmHg ($P < 0.01$), and in DBP of 3.3 mmHg ($p < 0.01$). The combined measures had additive effect on blood pressure

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reduction, giving decreases of 10.2 mmHg SBP and 7.5 mmHg DBP supine and 14.3 mmHg SBP and 7.5 mmHg DBP standing. The combination of reduced alcohol consumption and weight loss from calorie restriction leads to substantial and sustained reductions in blood pressure and to improved blood lipid profiles.

Leyatikul (41) had studied factors related to primary hypertension in the elderly. A case-control study was conducted in the Police General Hospital in Bangkok, in 1999. The total number of subjects were 354. After adjusting for potentially confounding factors. The significant risk factor was alcohol consumption (OR = 2.49, 95 % CI = 1.40 - 6.20, *p –value* = 0.004).

In contrast to the above, in Thailand, Voravong et al. (8) had studied hypertension in rural elderly and its associated factors. An analytic cross-sectional study was conducted in Sankampaeng area, Chiang Mai, in 1999 to study the factors associated with hypertension in the rural elderly. After adjusting for potentially confounding factors, alcohol consumption did not increase the prevalence of hypertension (OR = 1.87, 95 % CI = 0.60-5.84, *p –value* = 0.285).

2. Heredity

Blood pressure tends to be similar within families. Early studies showed that the first-degree relatives of hypertensive subject were more likely to have hypertension than were first-degree relatives of normotensive individuals.

Pandii (6) studied an epidemiology of essential hypertension and its complication of employees of Government Saving Bank Headquarter in 1995 using a cross-sectional study. One of factors found to be significantly related to essential hypertension (DBP) was heredity, (correlation coefficients = 0.0730, *p*- value < 0.01)

Voravong et al. (8) had studied hypertension in rural elderly and its associated factors. After adjusting for potentially confounding factors, the presence of family history of hypertension to associated with high the prevalence of hypertension (OR = 4.55, 95 % CI = 1.15-17.95, *p* –value = 0.031)

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Pinijkojchakorn (42) had studied factors associated with primary hypertension patients. Hospital based case–control study was conducted at Somdejtprachotaksinmaharat hospital in 2001. Case group (150 hypertensive patients) and control group (120 non-hypertensive patients) were compared. The presence of family history of hypertension associated with primary hypertension (*p*- value< 0.05).

Hunt et al. (43) had studied a positive family history definitions for defining risk of future disease. A follow up study was conducted with 7625 subjects. Normotensive persons aged 20-49 with two or more hypertensive first degree relatives developed high blood pressure 3.8 time as often as persons with no hypertensive first degree relative, in the duration of 7 years of follow-up.

3. Body mass index (BMI)

Overnutrition and its major manifestation, obesity, have now become a major health problem. Substantial clinical and epidemiological evidence supports the association between blood pressure and body weight. Obesity may be one of the best predictors for risk of development of hypertension. There was also a relation between degree of overweight and risk of hypertension.

Matsumura et al. (44) had studied association of body mass index with blood pressure in 80 year-old subjects. The aim of the study was to determine the association between body mass index (BMI) and blood pressure in 80 year - old subjects. A cross – sectional study was conducted in 645 Japanese, in 1998. Mean SBP rose from 146.6 mmHg in first quintile of BMI to 147.5 mmHg in the second, 150.3 mmHg in the third,151.6 mmHg in the fourth, and 156.4 mmHg in the fifth quintile (test for trend, $p = 0.006$). mean DBP rose from 75.8 mmHg in the lowest quintile of BMI to 81.8 mmHg in the highest (test for trend, $p = 0.002$) after controlling for factors known to influence blood pressure value . The association between body mass index (BMI) and blood pressure was highly statistically significant (*P* - value < 0.05).

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Bell et al. (45) had studied ethnic difference in the association between body mass index and hypertension. Cross-sectional data obtained from adult aged 30-65 years in China, the Philippines, and the United Stated during year 1997 –1998 were used (n= 13,309). High BMI was associated with a higher prevalence of hypertension in all ethnic groups. However, at BMI levels less than 25, difference in prevalence suggested a stronger association between body mass index and hypertension in Chinese men and women but not in Filipino women, compared with non-Hispanic whites. Non-Hispanic black and Filipino women had a higher prevalence of hypertension at every level of BMI compared with non-Hispanic Whites and Mexican American. The odds of prevalence hypertension increased more steeply with higher BMIs for Chinese men in comparison with non-Hispanic Whites. Chinese men in the BMI range 23.0-24.9 had hypertension odds of 2.09 (95%CI = 1.5-2.94) as compared with Chinese men in BMI range 18.5-22.9. The equivalent odds ratio for Mexican-America, non-Hispanic Whites, and non-Hispanic Black men were 1.23 (95%CI= 0.57-2.64), 0.89 (95%CI = 0.54-1.44), and 1.39 (95%CI = 0.86-2.22), respectively. These ethnic difference in the strength of association between BMI and warrant further investigation into the use of ethnicity – specific BMI cutoffs in clinical settings to more accurately identify individuals at risk of hypertension due to obesity.

Jo et al. (46) had studied prevalence, awareness, treatment, control and risk factors of hypertension in urban Korea population. A cross-sectional survey was conducted in Ansan-city, in 1999-2000. Multivariate logistic regression analysis showed that BMI was independent risk factor of hypertension (OR=1.18, 95% CI =1.08 –1.30)

Voravong et al (8) had studied hypertension in rural elderly and its associated factors. The association between hypertension and BMI after adjusting for potentially confounding factors, Elderly with BMI over 25 kg/m^2 or more were also found to increase the prevalence of hypertension compared with BMI of less than 25 kg/m^2 (OR = 1.15, 95 % CI = 1.06-1.25, *p* –value = 0.001)

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Whelton et al. (47) had studied weight loss in the treatment of hypertension in elderly. A randomized controlled trial of nonpharmacologic interventions in the elderly (TONE) was conducted with a total of 975 obese participants aged 60-80 years in 1998. The group which have been assigned to a specific intervention (sodium reduction, weight loss and combined sodium reduction and weight loss group) was compared to the group without such assignment. The relative hazard ratio was 0.70 ; 95%CI, 0.57-0.87, p <0.001 relative to controls group (not sodium reduction and weight loss). Hazard ratios among the obese participants were 0.64 (95%CI, 0.49-0.85, P =0.002) for weight loss alone and 0.47 (95%CI, 0.35-0.64; p<0.001) for reduced sodium intake and weight loss combined. Thus, sodium intake and weight loss constitute a feasible, effective, and safe non-pharmacologic therapy of hypertension in older persons.

Pauvilai (48) had studied hypertension prevalence at Ampur Ban Paew and some risk factors of hypertension. A cross-sectional survey of 407 persons, aged 40 to 69 years, was conducted in 2000, in Thailand. Over-weight was found to be independent risk factors for hypertension (p =0.0003).

4.Physical activity

Regular physical activity is associated with multiple health benefits, including a reduced incidence of CHD and stroke . Although it is generally accepted that regular physical activity also reduces blood pressure and prevents hypertension, there is still inconsistency among existing studies documenting these effects in older subjects.

Ohkubo et al. (49) had studied effects of exercise training on blood pressure values in older adults. The objective was to determine the effects of exercise training on blood pressure values of older adults, using home blood pressure measurement. A randomized controlled trial was conducted in Japan, 2001. The study subjects comprised 39 individuals , aged from 60 –81 years(22 subjects in the exercise group and 17 in the control group). Compared with control group, the exercise group showed a significant decrease in values for SBP (maximum between – group

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difference = 7.7 mmHg, p = 0.003) and DBP (4.2 mmHg, p = 0.001). These changes were observed for both genders. Therefore, exercise training was effective for older adults in lowering home blood pressure values.

Cox et al. (50) had studied long-term effects of exercise on blood pressure and lipids in healthy women aged 40-50 years. The Sedentary Women Exercise Adherence Trial (SWAT) was conducted in Australia in 2001. The objectives were to evaluate the long-term effects of regular moderate or vigorous intensity exercise on blood pressure and blood lipids in previously sedentary older women. Healthy, sedentary women (n=126) were recruited from community. Subjects exercised for 30 minutes, three times per week . They were evaluated at baseline, 6, 12, and 18 months. There was a significant fall of 2.81 mmHg in systolic blood pressure (p = 0.049) and 2.70 mmHg in diastolic blood pressure (p = 0.004) after correction for age and baseline values with moderate exercise, but not with vigorous- intensity exercise. When this analysis was repeated with change in body mass included, the results were unchanged . After correction for potential confounding factors, there was a significant fall in total cholesterol and low density lipoprotein cholesterol with vigorous but not moderate exercise at 6 months ($p < 0.05$) but not at 18 months. In this largely normotensive population of older women a moderate, but not vigorous exercise program, achieved sustained falls in resting systolic and diastolic blood pressure over 18 months. The study demonstrated that, in older women, moderate intensity exercise is well accepted, sustainable long-term and has the health benefit of reduced blood pressure.

Miyai et al. (51) had studied blood pressure response to heart rate during exercise test and risk of future hypertension. The purposes were to determine abnormal ranges of blood pressure responses in relation of heart rate increase during exercise and to examine the clinical utility of exercise blood pressure measurement in evaluating individual risk for developing hypertension. A cohort of 726 subjects was followed for hypertensive outcome for an average period of 4.7 years since 1995 to 1999. A cox proportional survival analysis revealed a significant increased risk for developing hypertension associated with exaggerated blood pressure response to

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exercise after multivariable adjustments for traditional risk factors (RR.=3.8 ; 95 %CI : 2.3 to 6.1). These results suggest that an exaggerated blood pressure response to heart rate during exercise is predictive of future hypertension independent of other important risk factors and lend further support to concept that blood pressure measurement during exercise test is a valuable means of identifying normotensive individuals at high risk for developing hypertension.

Hinderliter et al. (52) had studied reduction of Left Ventricular hypertrophy after exercise and weight loss in over weight patients with mild hypertension. The objective was to assess the effects of regular aerobic exercise or exercise plus weight management counseling on left ventricular mass and geometry in overweight, sedentary men and women with high-normal or mildly elevated blood pressure. A randomized, controlled trial was conducted at Duke University Medical Center, Durham, North Carolina in 2001. Eighty-two participants were assigned to supervised aerobic exercise only, a behavioral weight management program that included exercise, or a waiting-list control group for 6 months. Blood pressure and echocardiographic measures of left ventricular structure were measured at baseline and at the conclusion of the treatment phase. The participants had blood pressure fell by 7 and 6 mmHg of systolic blood pressure and diastolic blood pressure, respectively in the weight management group and by 3 and 4 mmHg of systolic blood pressure and diastolic blood pressure, respectively in the aerobic exercise group. In association with these decreases in blood pressure, participants in the intervention groups exhibited significant decreases in left ventricular relative wall thickness (p = 0.003), posterior wall thickness (p = 0.05), and septal thickness (p =0.004) and a trend toward a decrease in indexed left ventricular mass (p = 0.08) relative to the control group. Thus, in this cohort of overweight, sedentary men and women, exercise and weight loss reduced blood pressure and induced favorable changes in left ventricular structure.

Wheltom et al. (53) had studied effect of aerobic exercise on blood pressure. A meta–analysis of 54 randomized, controlled trials between 1966-2001 was conducted. Aerobic exercise was associated with a significant reduction in mean systolic and diastolic blood pressure (- 3.84 mmHg, 95% CI: -4.97 to –2.72 and -2.58 mmHg, 95% CI: -3.35 to –1.81, respectively). A reduction in blood pressure

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was associated with aerobic exercise in hypertensive and normotensive participants and in overweight participants and normal-weight participants.

Urata et al. (54) had studied antihypertensive and volume-depleting effects of mild exercise on essential hypertension. The objectives were to confirm the depressor effect of exercise, in comparison with on well-matched non exercised hypertensive controls, and to analyze change in hemodynamics, with special reference to blood volume and humoral factor. A randomized, controlled trials was conducted on 20 essential hypertensive in Japan, in 1987. The following significant changes were found only in the exercise group. Blood pressure was significantly (p <0.01) reduced. Whole blood and plasma volume indices were significantly reduced (p <0.05, p <0.01, respectively). The change in ratio of serum sodium to potassium positively correlated with the change in SBP (r = 0.76 , p<0.02). Plasma norepinephrine concentration both at rest and at the workload of blood lactate threshold during graded exercise tests were significantly reduced (p <0.05, p <0.02, respectively) after 10 weeks of exercise training.

Martin et al. (55) is study examined the antihypertensive efficacy of an aerobic exercise treatment regimen as compared with non aerobic exercise control (slow calisthenics and stretching). A randomized, controlled trials on 27 men with untreated mild hypertensive subjects in America was conducted, in 1990. DBP decreased 9.6 $\pm$ 4.7 mmHg in the aerobic exercise groups but increased 0.8$\pm$ 6.2 mmHg in the placebo control exercise groups (p =*0.02*). SBP decrease 6.4$\pm$9.1 mmHg in the aerobic exercise groups and increased 0.9$\pm$ 9.7 mmHg in the control exercise groups (p =*0.11*). Subsequently, seven of the nine controls entered a treatment crossover and completed the aerobic regimen with significant reductions in both DBP (- 6.1 $\pm$ 3.2 mmHg , P <0.01) and SBP (- 8.1 $\pm$ 5.7 mmHg, p<0.01).

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5. Smoking

Smoking cessation is perhaps the single most powerful lifestyle measure for the prevention of both cardiovascular and non-cardiovascular diseases in hypertensive patients.

Halimi et al. (56) had studied the risk of hypertension associated with smoking status. In a population –based cross-sectional study, 12417 volunteers (aged 20-69 years) were examined during 1 January to 30 June 1998, in France. The prevalence of hypertension was higher in former smokers than in never smokers (13.5% versus 8.8 %, *p* –value < 0.001). The risk of hypertension was higher (OR = 1.31, 95%CI=1.13-1.52, *p*–value <0.001) in former smokers than in never smokers, independently of age and alcohol intake. Both current and former smokers were at risk for systolic hypertension, especially those subjects aged 60 years and above. The risk of hypertension was associated with the number of cigarettes smoked (OR per 10 cigarettes smoked daily : 1.13 95%CI= 1.05-1.21, *p*–value <0.001) and the duration of smoking cessation (OR : 0.99, 95%CI= 0.98-1.00, *p* –value <0.01). When body mass index was entered into the model, the risk of hypertension in former smokers was no longer significant ; however, current smokers remained at risk for systolic hypertension.

Primatesta et al. (57) had studied the association between smoking and blood pressure. Cross –sectional data during 1994-1996 of the annual Health Survey for England were used to investigate differences in BP between smokers and nonsmokers in a nationally representative sample of adults(≥16 years old, 33860 cases). Older male smokers had higher systolic BP adjusted for age, BMI, social class, and alcohol intake than did nonsmoking men. No such difference were seen among younger men or for diastolic BP in either age group. Among women, light smokers tended to have lower BPs than heavy smokers and never smokers, significantly so for diastolic BP. Among men, a significant interaction between BMI and the BP-smoking association was observed. In women, BP differences between nonsmokers and light smokers were most marked in those who did not drink alcohol. These data show that any independent chronic effect of smoking on BP is

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small. Differences between men and women in this association are likely to be complex interrelations among smoking, alcohol intake, and BMI.
10

Cheryl et al. (58) had studied impact of smoking cessation on both clinical and ambulatory blood pressure and heart rate in postmenopausal women. A total of 66 women were randomly assigned using a 3:1 randomization. Ambulatory monitoring showed that the awake SBP decreased by 3.6 $\pm$ 1.9 mmHg in the treated subjects who quit smoking, whereas in the control group, there was an increase of 1.7 $\pm$ 2.4 mmHg (p = 0.45). Smoking cessation reduces SBP and HR during the daytime, when patients typically smoke. These hemodynamic changes are due in part to reductions in sympathetic nervous system activity.

In contrast to the above, Lee et al. (59) had studied effect of smoking cessation on changes in blood pressure and incidence of hypertension. A 4 year follow up study was conducted among 8170 healthy males. The aim of this study was to investigate the effects of smoking cessation on changes of blood pressure and incidence of hypertension in males who worked in the Republic of Korea during 1994 to 1998. The adjusted relative risks of hypertension in those who had quit smoking for < 1, 1 to 3, and $\geq$ 3 years were 0.6 (95%CI =0.2-1.9), 1.5 (95%CI= 0.8-2.8), and 3.5 (95%CI=1.7-7.4), respectively, compared with current smokers. The trends for increased risk of hypertension for longer periods of smoking cessation were observed in subgroups of those who maintained weight as well as those who gained weight after smoking cessation. The adjusted increments in both systolic and diastolic blood pressure were higher in those who had quit for $\geq$ 1 year than in current smokers. These trends among weight losers, as well as gainers and maintainers, were similar. The observed progressive increases in blood pressure with the prolongation of cessation in men, although at this time the mechanism remains unknown and must be clarified.

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6.Sodium intake

Epidemiologic studies suggest that dietary salt intake is a contributor to blood pressure elevation and to the prevalence of hypertension.

The Trials of Hypertension Prevention Collaborative Research Group (60) studied effectiveness of weight loss and sodium reduction intervention on blood pressure and hypertension incidence in overweight people with high-normal blood pressure. A randomized control trial was conducted, with 2382 subjects, age range 30-54 years, who were followed-up for a minimum of 36 months since 1994. BP decreases remained greater in the active intervention groups than in the usual care group (sodium reduction group, SBP reduction was 1.2 and DBP 7 mmHg ; combined group, SBP reduction was 1.1 and DBP 0.6 mmHg). Differences were statistically significant for systolic BP in the sodium reduction group. Through 48 months, the incidence of hypertension was significantly less in each active intervention group than the usual care group (average relative risks, 0.78-0.82)

Johnson et al. (61) had studied whether blood pressure is linked to salt intake and modulated by the angiotensinogen gene in normotensive and hypertensive elderly subjects. The objectives were to evaluate salt sensitivity in elderly subjects with different forms of hypertension with control group and to investigate any modulated by genotype. A randomized , double-binded, placebo-controlled trial was conducted with 46 subjects in Australia, in 2000. For the entire cohort, the mean $\pm$ standard error (SE) of changes from baseline in SBP for 50 ,100,200,and 300 mmol/day salt were 7.7 $\pm$ 2.4, 12.1 $\pm$ 2.4, 16.6 $\pm$ 3.0, 18.5$\pm$ 2.6 mmHg, respectively. For DBP, the respective changes were : -0.1 $\pm$ 1.5, 2.4 $\pm$ 1.6, 3.0 $\pm$ 1.5, 5.8$\pm$ 1.7 mmHg. The increase in SBP among isolated systolic hypertensive (ISH) subjects was significant higher than among subjects in the SDH (diastolic $\pm$ hypertension) and normotensive groups ($p< 0.05$). AGT genotype influenced the effect of salt dose on the change in DBP ($p=0.006$) but not SBP ($p = 0.7$). In healthy, older subjects , a linear increase in BP occurred with increasing salt dose. It appeared most pronounced in ISH subjects and could be modulated by AGT genotype.

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Hypertension Prevention Trial Research Group (HPT) (62) had studied three-year effects of dietary change on blood pressure. A randomized controlled trial was conducted among 841 subjects who were enrolled at four clinics in 1983. All four dietary counseling treatment groups had lower mean blood pressure than the control group. The largest net reduction in blood pressure occurred in the calorie controlled group : diastolic blood pressures were 2.8 mmHg and 1.8 mmHg and systolic pressure, 5.1 mmHg and 2.4 mmHg at 6 month and 3 years, respectively. All four dietary counseling treatment groups experienced fewer hypertensive events ; particularly in the sodium controlled groups.

Vollmer et al. (63) had studied effects of diet and sodium intake on blood pressure in subgroup analysis1 of DASH-Sodium trial . The objective was to determine effects on blood pressure of reduced sodium intake. A randomized control trial was conducted with 412 adults with untreated hypertension and participants followed the DASSH diet or a control (typical U.S.) diet for three consecutive 30 day feeding periods. In all subgroups, the DASH diet and reduced sodium intake were each associated with significant decrease in blood pressure ; these two factors combined produced the greatest reduction. Among nonhypertensive participants who received the control diet, lower (vs higher) sodium intake decreased blood pressure by 7.0(SBP) and 3.8 (DBP) mmHg in those older than 45 years of age ($p<0.001$) and by 3.7 (SBP) and 1.5 (DBP) mmHg in those 45 years of age or younger ($p<0.05$), thus the DASH diet plus reduced sodium intake is recommended to control blood pressure.

Midgley et al. (64) had studied effect of reduced dietary sodium on reduction of blood pressure in hypertensive and normotensive individuals. A meta–analysis of 56 randomized controlled trials between 1966-1994 was conducted. The decrease in blood pressure for a 100 mmol/d reduction in daily sodium excretion was 3.7 mmHg (2.35-5.05mmHg) for systolic ($p<0.001$) and 0.9 mmHg (-0.13 – 1.85 mmHg) for diastolic ($p=0.09$) in the hypertensive trials, and 1.0 mmHg (0.51-1.56 mmHg) for systolic ($p<0.001$) and 0.1 mmHg (-0.32 to 0.51 mmHg) for diastolic ($p=0.64$) in the normotensive trials. Decreases in blood pressure were larger in trials of older

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hypertensive individuals and small and non significant in trials of normotensive individuals.

7.Total fiber foods

Total fiber affects gastrointestinal function and, indirectly, metabolism of glucose and lipids. Mechanisms relevant to lipid metabolism are also important as higher cholesterol levels may affect blood pressure by increasing vascular reactivity. Vegetarians have lower blood pressure than meat eaters and vegetarian dietary patterns can lower blood pressure in hypertensive patients. A series of controlled dietary trials indicated that these effects depend on a combination of effects of fruit, vegetables, fiber and low saturated fat intake rather than the presence or absence of meat protein. This conclusion has been confirmed in a recent study in which older subjects with mild or borderline hypertension were randomized for eight week periods to continue their normal diet, to increase fruit and vegetable consumption alone, or to also reduce their consumption of total and saturated fat.

Appel et al. (65) had studied the effects of dietary patterns on blood pressure in the United State of America 450 adults, 22 years of age or older were enrolled sequentially in groups ; the first group began in 1994, and the fifth and last group started in 1996. The combination diet reduced SBP and DBP by 5.5 and 3.0 mmHg, respectively, than the control diet (p <0.001 for each) ; the fruit and vegetables diet reduced SBP by 2.8 mmHg (p <0.001) and DBP by 1.1 mmHg (p <0.07), than the control diet. Among the 133 subjects with hypertension, the combination diet reduced SBP and DBP by 11.4 and 5.5 mmHg, respectively, more than the control diet (p<0.001 for each). Among the 326 subjects without hypertension, the corresponding reductions were 3.5 mmHg (p <0.001) and 2.1 mmHg (p =0.003). Diet rich in fruits, vegetables, and low-fat dairy foods and with reduced saturated and total fat can substantially lower blood pressure.

Burke et al. (66) had studied dietary protein and soluble fiber on reduction of ambulatory blood pressure in treated hypertensives in 2000. In the randomized

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controlled trial, in Australia, patients (n=41) were randomized to 1 of 4 groups. In 36 subjects who provided complete data, protein and fiber had significant additive effect to lower 24-hour and awake SBP. Relative to control subjects, the net reduction in 24-hour SBP was 5.9 mmHg with a fiber and protein (*p*=0.001).

Block et al. (67) had studied about ascorbic acid status and subsequent diastolic and systolic blood pressure. The objective was to investigated the relationship between blood pressure and antioxidants, including plasma ascorbic acid (AscA), in a 17 –week control-diet study. Study subjects included 68 men aged 30 to 59 years. Plasma AscA was inversely related to diastolic blood pressure 1 month later (correlation -0.48 , *p*=0.0001). Persons in the lowest quarter of the plasma AscA distribution had > 7 mmHg higher DBP than did those in the top fourth of plasma AscA distribution. Plasma AscA was significantly associated with SBP in logistic regression analysis. Vitamin C may be an important component of the effectiveness of fruit and vegetable in reduction in blood pressure, and tissue AscA levels may be important in maintenance of low blood pressure.

Margetts et al. (68) had studied vegetarian diet in mild hypertension. A randomized controlled trial was conducted that 56 subjects aged 30-64 in Australia. The objective was to examine the effect of a vegetarian diet in subjects had mild untreated hypertension in 1983. A fall in SBP by 5 mmHg occurred during the vegetarian diet periods, with a corresponding rise on resuming a meat diet. The main nutrient changes with the vegetarian diet included an increase in the ratio of polyunsaturated to saturated fats and intake of fiber, calcium, vitamin B_{12} . In untreated subjected with mild hypertension, changing to a vegetarian diet may bring about a worthwhile fall in systolic blood pressure.

Alberto et al. (69) had studied nutritional factors and hypertension among US men . A prospective study was conducted with among 30681 subjects in 1986. During 4 years of follow-up, 1248 men reported a diagnosis of hypertension. Diet fiber had an independent inverse association with hypertension. For men with a fiber

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in take of < 12 g/day, the relative risk of hypertension was 1.57 (95%CI=1.20 to 2.05) compared with an intake of >24 g/day.

Witteman et al. (70) had studied of nutritional factors and hypertension among US women. A prospective study was conducted with among 58218 subjects in 1980. During 4 years of follow-up, 3275 women reported a diagnosis of hypertension. A calcium intake of at least 800 mg/day the relative risk of hypertension was 0.78 (95%CI = 0.69 - 0.88) when compared with an intake of less than 400 mg/day. The relative risk for magnesium intake of 300 mg/day. or more compare with an intake of less than 200 mg/day was 0.77 (95%CI= 0.67 - 0.88).

Joffres et al. (71) had studied relationship of magnesium in take and other dietary factors to blood pressure in The Honolulu Heart study. The purpose of this study was to test the hypothesis that magnesium intake was related to blood pressure in elderly while the influence of the other nutrients was also examined. Dietary intake, assessed by 24-h recall method, were investigated in 615 men of Japanese ancestry living in Hawaii, in 1980 to 1982. Dietary intakes were significantly inversely associated with blood pressure. Magnesium had the strongest association with blood pressure.

Allender et al. (72) had studied dietary calcium and blood pressure in a meta-analysis of randomized clinical trials. The purpose was to assess the effect of dietary calcium supplementation and blood pressure. Data from 22 trials and the total sample size comprised 1231 persons. The pooled estimate shows a statistically significant decrease of SBP with calcium supplementation, both for hypertensive persons and for the overall sample. However, the effect was too small to support the use of calcium supplementation for preventing or treating hypertension.

8. Fatty food

Toft et al. (73) had studied effects of n-3 polyunsaturated fatty acids on glucose homeostasis and blood pressure in essential hypertension. The objective was

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to determine whether dietary supplementation with fish oil adversely affects glycemic control in patient with hypertension. A randomized controlled trial was conducted with 78 subjects with untreated hypertension in Norway during 1988 to 1992. Fish oil that rich in polyunsaturated fatty acids of the n-3 family may lowered SBP by 3.8 mmHg more than control (p =0.04) and lowered DBP by 2.0 mmHg more than control (P =0.01). After fish oil treatment, triglyceride levels decreased by 0.28 $\pm$ 0.08 mmol /L more than control (p =0.01), and VLDL-c levels decreased by 0.13 $\pm$ 0.04 mmol /L more than control (p =0.01). Fish oil, in dose that reduce blood pressure and lipid levels in hypertensive persons, did not adversely affect glucose metabolism.

Pandee (6) had studied an epidemiology of essential hypertension and its complication of employees of Government Saving Bank Headquarter in 1995 using a cross-sectional study. One of factors found to be significantly related to essential hypertension (SBP) was total cholesterol, (r = 0.1788, p- value < 0.01).

Puddey et al. (41) had studied effects of alcohol and caloric restrictions on blood pressure and serum lipids in overweight men. The aim was to assess whether a combined approach using both caloric (total calories that with protein, fat, and carbohydrate provided as 15 %, 30%, and 55%, respectively) and alcohol restrictions would have potentially additive or synergistic effects in lowering BP in such subjects. A randomized, controlled trial was conducted in Australia in 1992. Calorie reduction was associated with decreases in SBP of 5.4 mmHg (p < 0.01), and in DBP of 4.2 mmHg (p < 0.01). The combined measures had additive effect on blood pressure reduction , giving decreases of 10.2 mmHg SBP and 7.5 mmHg DBP supine and 14.3 mmHg SBP and 7.5 mmHg DBP standing. The combination of reduced alcohol consumption and weight loss from calorie restriction leads to substantial and sustained reductions in blood pressure and to improved blood lipid profiles.

Knapp et al. (74) had studied the antihypertensive effects of fish oil. A controlled study of fish oil supplements in essential hypertension. The objective was to investigate the relation between dietary supplements of fish oil, blood

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pressure, and production of endogenous eicosanoids in 32 essential hypertensive, in US in 1989. Blood pressure decreased in the men who received the high dose of fish oil (SBP by a mean of 6.5 mmHg, $p<0.03$ and DBP by 4.4 mmHg, $p<0.015$), but not in the other groups (low dose of fish oil, Safflower oil and mixed oils).

In contrast to other studies, Morris et al. (75) had studied the effects of fish oil on blood pressure in mild hypertensive subjects. A randomized crossover trial was conducted with 18 subjects in America in 1993. There was no significant changes in home or clinic blood pressure measurement. Clinic blood pressure after 12 g fish oil /day was slightly lower than after placebo treatment by –0.8/-0.4 mmHg (95% CI : SBP –4.4 to +2.8, DBP -3.2 to +2.4), thus fish oil had no significant effect on BP in untreated mildly hypertensive subjects, regardless of dose (6 or 12 g/d) or length of treatment (6 or 12 wk).

Salonen et al. (76) had studied relationship between blood pressure, dietary fats, and antioxidants. A prospective population study was conducted with 722 eastern Finnish men aged 54 years in 1984 – 1986. Both plasma ascorbic acid (p =0.0008) and serum selenium (p=0.0017) concentrations had a moderate, independent inverse association with mean BP, estimated dietary intake of saturated fatty acids had a positive association (p =0.013), and estimated dietary intake of linolenic acid had a inverse association (p =0.048) associated with mean blood pressure.

9. Type A behavior

Behavioral assessment of Type A (77) or Type B obtained by the structure interview method has some inherent meaning, one may question whether Type A behavior in contrast to Type B behavior affects overall health beyond CHD. Do type A subject have poorer health than Type B subjects when considering all cause mortality and morbidity ? Potentially, Type A behavior could be a marker of behavioral, neurohormonal, or neuroimmunologic links that are related to various disease out comes.(78) For example, some clinical studies have shown that under

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certain challenging conditions, Type A subjects have increased cardiovascular and catecholamine responses. It is possible that chronic biologic stress responses over a lifetime could have a detrimental impact on multiple organ systems, perhaps depending on individual genetic, physiologic, and psychologic predispositions.

Yakubovich et al. (79) had studied Type A behavior pattern and health status after 22 years of follow-up in The Western Collaborative Group Study. This study tested the hypothesis that Type A / B behavior was associated with ill health. The original cohort was 3154 healthy men aged 35-59 years, who entered the study in 1960-1961. Information on chronic disease conditions was obtained from 2365 men aged 61-81 years, who had volunteered to participate in The Western Collaborative Group Study in 1960-1961, who were surviving and located in 1982-1983. Type A/B behavior was not significantly associated with all-cause mortality over the 22 years follow-up. However, among 61-71 years of aged, behavior type was positively associated with morbidity index ($p < 0.001$). Furthermore, behavior type and the morbidity index showed a dose-response association ; extreme Type A personality had the highest level of morbidity, while those with the lowest level of Type A had the lowest level of morbidity.

Pinijkojchakorn (42) had studied factors associated with primary hypertension. Hospital based case–control study was conducted at Somdejtprachotaksinmaharat hospital in 2001 using 150 hypertensive patients and 120 controls. Mental stress associated with primary hypertension (p- value< 0.05).

Pandee (6) had studied an epidemiology of essential hypertension and its complication of employees of Government Saving Bank Headquarter in 1995. One of factors found significantly inverse related to essential hypertension (SBP) was mental stress, ($r = 0.1197$, p-value < 0.01). Mental stress was measurement by HOS (health opinion survey).

Jane et al. (80) had studied prevalence of Type A behavior in untreated hypertensive individuals. The objective was to investigate the hypothesis that Type

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A behavior is associated with hypertension. A cross-sectional was conducted with 218 subjects in Canada in 1991. Type A behavior was assessed by the structured interview (SI). The results indicated that Type A behavior is more prevalent in untreated, mildly hypertensive individuals than matched normotensive subjects (79%, 60 %, respectively, $p<0.02$).

In contrast to another study, Winkleby et al. (81) had studied the association between self-reported stress and hypertension. The objective was to test the hypothesis on a positive association between psychosocial stress and hypertension. A cross-sectional was conducted with the subjects 1428 San Francisco bus drivers in 1983 to 1985. Inverse association between the stressors index and hypertension that significant after adjustment for 12 potential confounding variables (OR=0.84, $p= 0.038$). In contrast to the inverse association with hypertension, highly significant positive association were found between the stressors index and other health such as gastrointestinal, respiratory, and musculoskeletal (OR=1.20, 1.43 , 1.71 , $p < 0.05$ respectively).

Montfrans et al. (82) had studied relaxation therapy and continuous ambulatory blood pressure in mild hypertension. A randomized controlled trial was conducted with 35 subjects aged 20-60 years in Amsterdam University hospital in 1990. It was found that relaxation therapy was ineffective method of lowing 24 hours blood pressure, being no more beneficial than non-specific advice, support, as a treatment for hypertension.

In conclusion from literature reviews, essential hypertension associated with the multi-factors such as

1. Non-modifiable factors which are age, gender and family history of hypertension.

2. Modifiable factors or lifestyle, which include excess body weight, smoking, alcohol consumption, salt intake, pattern of dietary (fiber diet, fatty diet), physical activity, and stress.

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This study, have a limitation to assess a nutrition by biochemical assessment method, so only dietary assessment and total cholesterol (TC) will be used. Stress is difficulty to assess, so type A behavior is conducted in order to assess level of stress.

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Web of causation

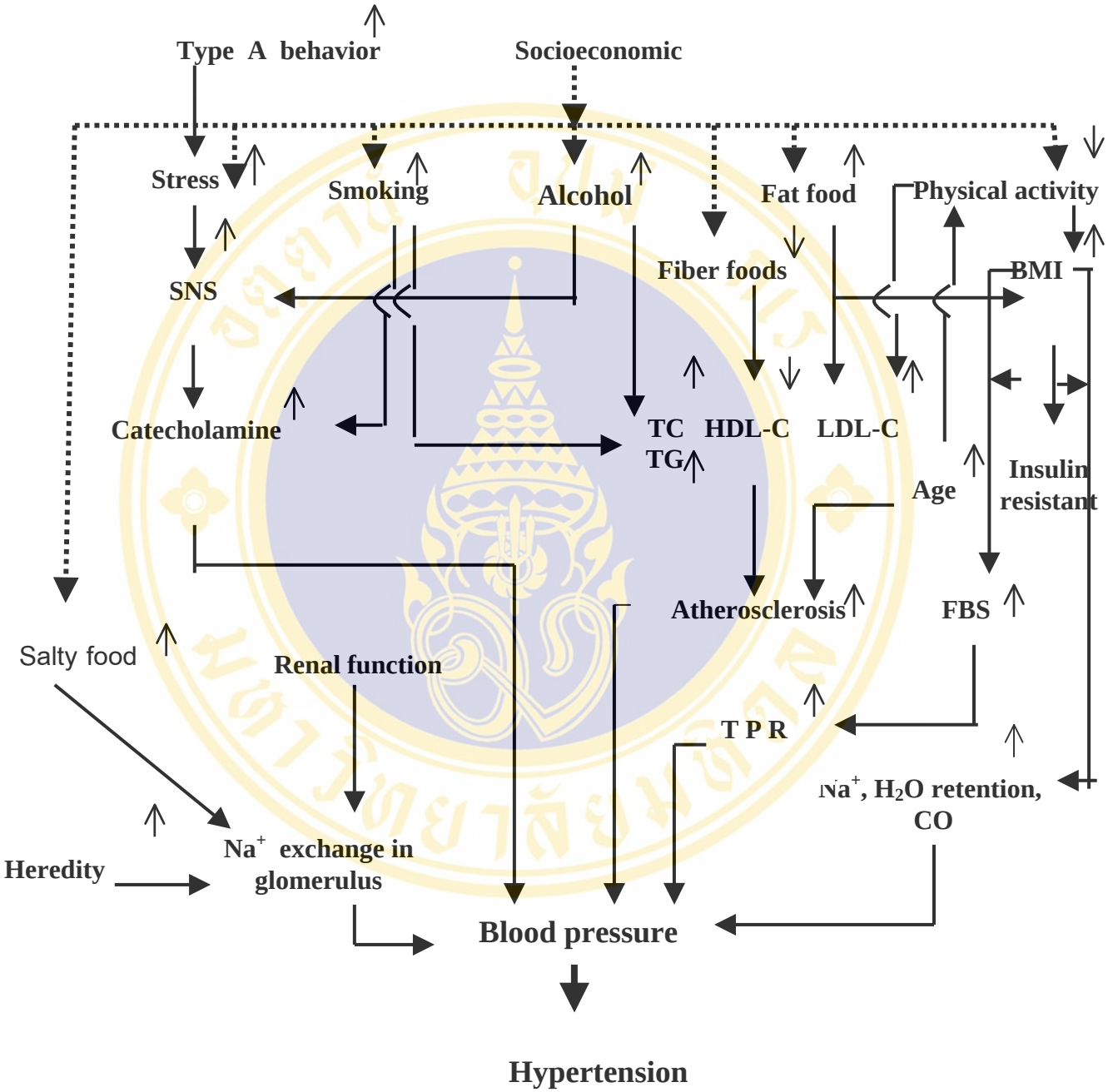

Figure 3. Web of causation

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Conceptual framework

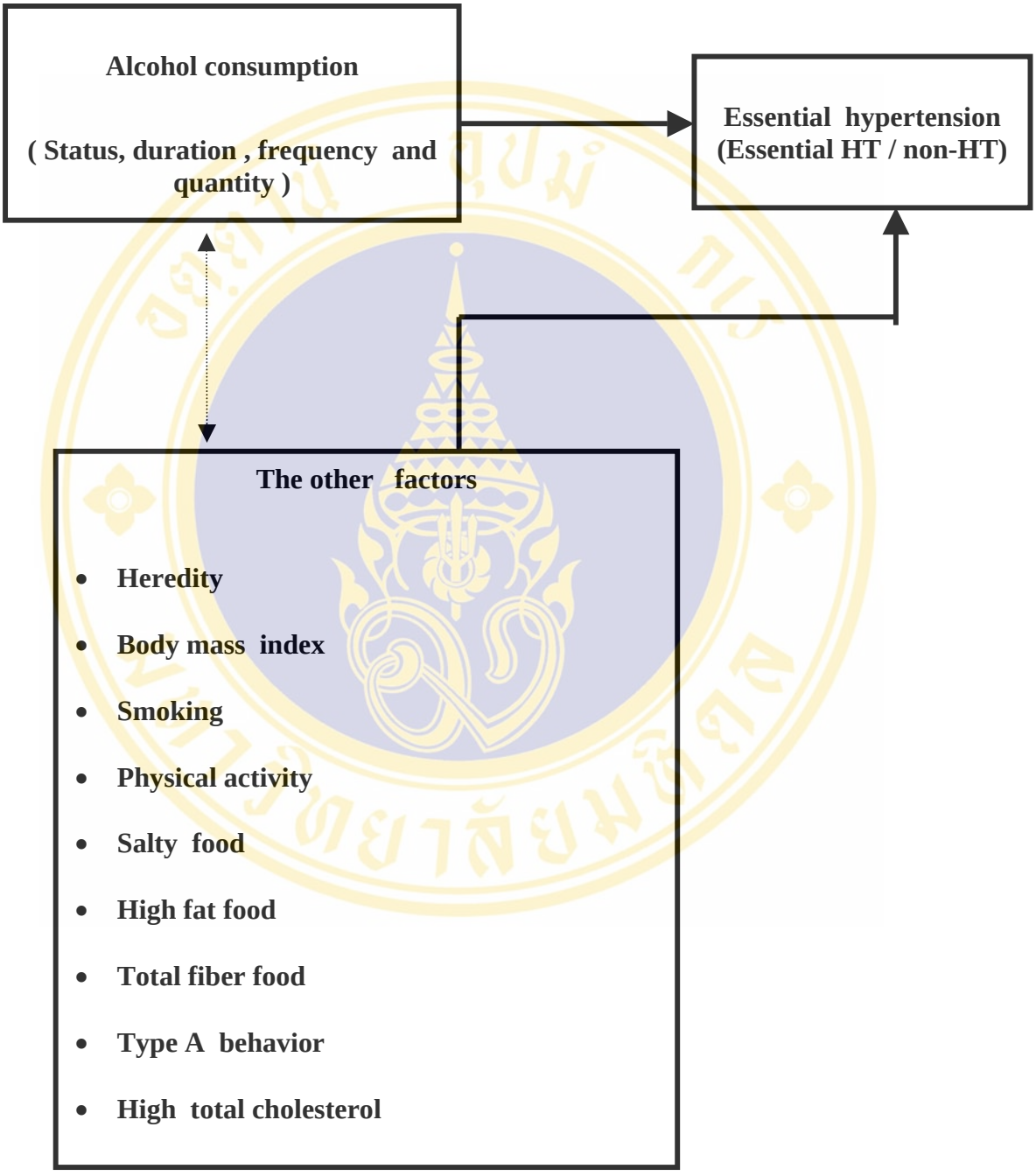

Figure 4. Conceptual framework

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CHAPTER 3
MATERIALS AND METHODS

Research Design

This study is a hospital- based case- control study. A ratio of cases per controls is 1 : 1 and they are matched for sex and age (±5 years) with individual match.

Study population

Participants in the study are groups of patients who come for treatment at Pua Hospital in Nan province between October 2002 to February 2003.

Study population is divided into 2 groups

The characteristic of the sample selection is the participants who take part in the study have to meet the following criteria .

Cases group

Patients who are first diagnosed with essential hypertension by physicians between January 2002 to February 2003 and patients who are currently under treatment for hypertension clinic of Pua hospital in Nan province for not more than 1 years. The age ranges is between 30-60 years.

Controls group

Patients are patients who come for treatment at out patient department of Pua hospital, without evidence of hypertension (blood pressure are measured as routine practice). Controls are matched with case by sex and age (±5 years).

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Exclusion criteria

Patients are excluded from the study samples when :

Case groups

1. They are diagnosed with secondary hypertension, diabetes mellitus, heart diseases and pregnancy.
2. Having a complications from hypertension.
3. Mental disorder because it can not get information
4. Patients who refuse to participate in the study.
5. Patients who could not verbally communicate with the researcher due to the problems of hearing loss and language barrier.

Control groups

1 Control group must not have chronic diseases associated with alcohol consumption such as : hepatitis, alcoholism, cancer, secondary hypertension, diabetes mellitus, heart diseases, HIV positive and pregnancy because it is not freedom from exposure.

2 Mental disorder because it can not get information

3 Patients who refuse to participate in the study.

4 Patients who could not verbally communicate with the researcher due to the problems of hearing loss and language barrier.

Sample size

The estimated sample size was calculated on case – control study from the following formula. (83), (84)

Where:

n = the estimated sample size of cases.

$$n = \frac{\left[Z_{\alpha/2}\sqrt{2\,\overline{p}\,\overline{q}} + Z_{\beta}\sqrt{p_1 q_1 + p_0 q_0}\right]^2}{(p_1 - p_0)^2}$$

$$p_1 = \frac{p_0 \times OR}{[1 + p_0(OR - 1)]}$$

$$\overline{p} = \frac{p_1 + p_0}{2}, \overline{q} = 1 - \overline{p}$$

$$q_1 = 1 - p_1, q_o = 1 - p_0$$

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OR = 2.12, for persons who drank 46 – 68.9 g / day of ethanol (33)

P_0 = 0.42 (Prevalence of alcohol consumption in northern Thailand) (3)

Parameters :

1. P_0 (Proportion of alcohol consumption in control group) = 0.42
2. OR (Expected odd ratio) = 2.12
3. $Z_{\alpha/2}$ (Standard value of Z score at type I error = 0.05) = 1.96
4. Z_{β} (Standard value of Z score at type II error = 0.1) = 1.28
5. The sample ratio between cases and controls = 1 : 1

Therefore

$$P_1 = \frac{2.12 \times 0.42}{[1 + 0.42(2.12 - 1)]} = 0.61$$

$$\overline{P} = \frac{0.61 + 0.42}{2} = 0.51$$

$$n = \frac{[1.96\sqrt{2 \times 0.51(1 - 0.51)} + 1.28\sqrt{0.61(1 - 0.61) + 0.42(1 - 0.42)}]^2}{(0.61 - 0.42)^2}$$

$$n = 150.27 \approx 151$$

Therefore, the calculated number of the sample group are 151 cases in each group. The total sample size are 302 patients that are required for the study.

Research instrument

The questionnaire is specially designed on the conceptual framework, will be tested and improved by the professional. It consists of five parts :

Part I **:** Demographic data : sex, age, marital status, religion, resident, education , occupation, income family and family history of hypertension

Part II **:** Health behavior : smoking, physical activity, alcohol consumption (status, quantity, frequency and duration of alcohol consumption). Alcohol consumption was interviewed by questionnaire. Subjects were asked whether they

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currently drank alcoholic beverages, if not, whether they had done so in past. Drinkers were asked how often they usually drank alcoholic beverages, quantity, type and duration of alcohol consumption.

Part III : Data of Dietary pattern : three food item group (fatty diet, total fiber food, and salty diet)

Part IV : Data of Type A behavior : It consist questionnaire 10 items.

Part V : History of medical conditions (copy from medical record) : Diagnosis, Date / Month / Year, get diagnosis, Weight, Height, Blood pressure and blood chemistry.

The questionnaire & Quality Control

Content validity of the questionnaire will be examined. It will be revised for clearer content and suitability according to the experts' recommendations, and it will be subsequently tested with the group of 15 hypertensive patients and 15 non-hypertensive patients at Pua Hospital in Nan province.

Data collection

1. One interviewer is responsible for data collection. During October 2002 and February, 2003. Patients who fulfill the eligibility criteria were transferred to the research unit and are interviewed individually.

2. Data of medical history : diagnosis, body weight, height, blood pressure, total cholesterol, and Fasting blood sugar was copied from the patients' medical record (OPD Card)

Controls, who were subsequent patients without hypertension, with the same sex and age ($\pm$ 5 years) one asked to participate. After the informed consent was signed, the data collection (as the same process as cases) were performed.

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Data analysis

The statistics used in data analysis are :

1. Descriptive statistics is used to analyze general characteristics of cases group and controls group by frequency, percentage, mean and standard deviation.

2. Analytical statistics

2.1 Univariate analysis : OR, 95%CI, χ^2 Test .

2.2 Multivariate analysis

Multiple logistic regression analysis was performed to simultaneously control the confounders and to assess possible interaction.

Scope of the research

The research study will be conducted with a group of essential hypertensive patients on the following conditions :

1.Cases are patients with essential hypertension (according to the criteria) who had first diagnosis by physician and the patients who currently receive treatment at the hypertension clinic (not more than 1 years) at Pua hospital between January 1,2002 and February 28, 2003.

2.Controls are patients who come for treatment at out patient department, Pua hospital between October 1, 2002 and February 29, 2003 without evidence of hypertension.

Ethical implication

The proposal will be reviewed and approved by Mahidol University Ethical Committee. Permission will be obtained from the Director of Nan province public health office and the Director of Pua hospital. The details of the study protocol are explained to the subjects, and informed consent was obtained prior to data collection.

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CHAPTER 4
RESULTS

This case-control study was conducted to determine the relationship between alcohol consumption and essential hypertension. The data were collected by interviewing 151 of cases and 151 of controls the who received treatment at Out Patient department of Pua hospital, Nan Province. The studied results were presented as follow :

1.General information
1.1 Socio-demographic characteristics.
1.2 Drinking status
1.3 Drinkers' characteristics.

2.Comparison of patient characteristics which are associated with essential hypertension (Univariate analysis)

3. The multivariate analysis for the association between alcohol consumption and essential hypertension by controlling potential confounders (Multiple Logistic Regression analysis)

1.General information

1.1 Socio-demographic characteristics

The socio-demographic characteristics of cases and controls were shown in table 9. The characteristics included sex, age, marital status, religion, education level, occupation and family income. The results of the comparison of various socio-demographic characteristics between cases and controls for each variable mentioned above were as follow :

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Sex and age

Cases and controls were matched by sex and age (within 5 years). Therefore age-structure was not different. The majority of cases and controls in this study were female (54.3 %) and between 40-49 years of age (58.9 % and 58.3 % respectively). The average age were 46.08 (SD = 6.17 years), and 44.33 years (SD = 5.82 years) in case and control group respectively. This difference was not statistically significant (*p-value* = 0.807).

Marital status

The majority of cases and controls were couple (92.1 % and 86.8 % respectively). The single, widowed, divorce and separated group has only 7.9 % of cases and 13.2 % of controls. This difference was not statistically significant (*p-value* = 0.135).

Religion

The majority of cases and controls were Buddhist (98 % and 99.3 % respectively). Christians consisted only 2 % of cases and 0.7 % of controls. This difference was not statistically significant (*p-value* =0.314).

Educational level

The educational level in cases and controls were different. The majority of cases attended elementary level (66.2 %) and controls attended vocational school and university level (61.6 %), while 12.6 % of cases and 0.7 % of controls were illiterate. This difference was statistically significant (*p-value* < 0.001).

Occupation

Occupation in cases and controls were different. The majority of cases were agriculturist (61.6 %) and controls were government employee (78.8 %). The second largest group were labour employee (13.2 % of cases) and office employee (11.3 % of controls). This difference was statistically significant (*p-value* <0.001).

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Family income

Family income in cases and controls were different. The majority of cases had the family income ≤ 5,000 baht per month (66.2 %) while the majority of controls had the family income between 5,001 -10,000 baht per month (35.1%). The mean of the family income in case and control groups were 5,423 baht per month (SD = 3,594 baht per month) and 12,464 baht per month (SD = 5,222 baht per month), respectively. This difference was statistically significant (*p-value*< 0.001).

Table 8. Socio-demographic characteristics in case and control groups

Characteristic	Case n=151		Control n=151		*p*-value
	N	%	N	%	
Age (Year)					
30 – 39	25	16.6	29	19.2	0.807**
40 – 49	89	58.9	88	58.3	
50 – 60	37	24.5	34	22.5	
Mean (SD)	46.08	(6.17)	44.33	(5.82)	
Gender					
Male	69	45.7	69	45.7	1.000**
Female	82	54.3	82	54.3	
Marital status					
Couple	139	92.1	131	86.8	0.135**
Single, widowed, - divorce and separated	12	7.9	20	13.2	
Religion					
Buddhist	148	98.0	150	99.3	0.314**
Christian	3	2.0	1	0.7	

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Table 8 (continued)

Characteristic	Case n=151		Control n=151		*p*-value
	N	%	N	%	
Educational level					
Illiterate	19	12.6	1	0.7	<0.001**
Elementary	100	66.2	13	8.6	
High school	18	11.9	44	29.1	
Vocational school and	14	9.3	93	61.6	
University					
Occupation					
Agriculturist	93	61.6	8	5.3	<0.001**
Government employee	17	11.3	119	78.8	
Labour employee	20	13.2	1	0.7	
Household job	3	2.0	2	1.3	
Office employee	5	3.3	17	11.3	
Merchant	13	8.6	4	2.6	
Family Income per month (Baht)					
≤ 5,000	100	66.2	11	7.3	
5,001 – 10,000	39	25.8	53	35.1	
10,001 – 15,000	7	4.6	47	31.1	
> 15,000	5	3.3	40	26.5	
Mean (SD)	5,423	3,594	12,464	5,222	<0.001*

* *p-value from t-test*

** *p-value from chi square test*

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1.2 Alcohol drinking status

Non-drinker

Non-drinker was defined as person who never drank alcohol beverage and / or who had drank < 2 times per month. There were 21.9 % and 50.3 % in case and control groups, respectively.

Former – drinker

Former – drinker mean person who drank alcohol beverage previously and had ceased alcohol consumption ≥ 1 year before diagnosis. There were 10.6 % and 7.9 % in case and control groups, respectively.

Current – drinker

Current drinker mean person who drank alcohol beverage in current or previously and had ceased alcohol consumption < 1 year before diagnosis. There were 67.5 % and 41.7 % in case and control groups, respectively.

The majority of cases were current drinkers (67.5 %) while the majority of controls were non-drinkers (50.3%). The drinking status was shown in table 9.

Table 9. Alcohol consumption in case and control groups

Drinking status	Case n=151		Control n=151	
	N	%	N	%
Non drinker	33	21.9	76	50.3
Former-drinker	16	10.6	12	7.9
Current drinker	102	67.5	63	41.7

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1.3 Drinkers' s characteristics.

Alcohol drinking among cases and controls was considered in terms of duration of drinking (year), frequency of drinking per week (day) and quantity of drinking per week (gm).

Duration of alcohol intake (year)

The majority of drinkers in the case groups had the duration of alcohol intake $\geq$ 21 years and control groups had the duration of alcohol intake between 11-20 years (39.1 % and 23.8 % respectively). The mean duration of alcohol intake in case and control groups were 21.93 years (SD = 6.64 years) and 20.53 years (SD = 6.78 years), respectively.

Frequency of alcohol intake (day / week)

The majority of drinkers in the case and control groups had drank between one or two days a week (44.4 % and 25.8 % respectively). The mean frequency of alcohol intake in case and control groups were 6.92 days / month (SD = 5.82 days / month) and 6.52 days / month (SD = 4.75 days / month), respectively.

Quantity of alcohol intake (gm per week)

The majority of drinkers in the case had drank between 1-140 gm / week (45 % and 33.1 % respectively). The mean quantity of alcohol intake in cases and controls groups were 176.75 gm / week (SD = 154.7 gm / week) and 131.76 gm / week (SD = 132.1 gm / week), respectively. The drinkers's characteristics of all subjects were shown in table 10.

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Table 10. Drinkers' characteristics in case and control groups

Alcohol consumption	Case n=151		Control n=151	
	N	%	N	%
	n = 118		n = 75	
Duration of alcohol intake (year)				
0	33	21.9	76	50.3
1-10	8	5.3	7	4.6
11-20	51	33.8	36	23.8
≥ 21	59	39.1	32	21.2
Mean (SD)	21.93	(6.64)	20.53	(6.78)
Frequency per week (day)				
0	33	21.9	76	50.3
<1	30	19.9	26	17.2
1-2	67	44.4	39	25.8
3-4	21	13.9	10	6.6
Mean (SD)	6.92	(5.82)	6.52	(4.75)
Quantity of alcohol intake per week (gm)				
0	33	21.9	76	50.3
1-140	68	45.0	50	33.1
141-280	30	19.9	18	11.9
≥ 281 Mean (SD)	20	13.2	7	4.6
	176.75	(154.7)	131.76	(132.1)

2.Comparison of patient characteristics using univariate analysis.

2.1 Alcohol consumption

The studied factors were alcohol drinking status, duration of drinking (year), frequency of drinking per week (day) and quantity of drinking per week (gm). It was found that there was statistically significant association between alcohol consumption and essential hypertension. (Table 11)

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The increased risk of essential hypertension were found to be associated with the followings.

2.1.1 Alcohol drinking status

There was a statistically significant association between alcohol drinking status and essential hypertension . Current drinkers had the highest risk compared to non drinkers (OR = 3.47, 95 % CI = 2.06-5.86). Former drinkers had 2.76 times (95 % CI = 1.16- 6.56) higher risk of essential hypertension than non drinkers. (Table 11)

2.1.2 Duration of alcohol intake (year)

Duration of alcohol drinking of ≥ 21 years had the highest risk compared to non drinkers (OR = 3.55, 95 % CI = 1.82-6.93). Drinkers of 11-20 years had 3.33 times (95 % CI = 1.84-6.03) higher risk of essential hypertension than non drinkers. There was a statistically significant association between duration of alcohol drinking and essential hypertension, whereas drinkers of 1-10 years had no statistically significant risk (OR=2.92 , 95 % CI = 0.96 – 8.91). (Table 11)

2.1.3 Frequency per week (day)

There was a statistically significant association between frequency of alcohol consumption and essential hypertension. There was a dose-response relationship. Drinkers who drank 3-4 days / week had the highest risk compared to non-drinkers (OR = 4.31, 95 % CI = 1.79-10.35). Drinkers of 1-2 days / week had 3.66 times (95 % CI = 2.05-6.54) and drinkers of < 1 days week had 2.65 times (95 % CI = 1.36-5.15) higher risk of essential hypertension than non–drinkers. (Table 11)

2.1.4 Quantity of alcohol consumption per week (gm)

There was a statistically significant association between quantity of alcohol consumption and essential hypertension. There was a dose-response relationship. Drinkers who drank 281 gm / week or more had the highest risk compared to non- drinkers (OR = 6.06, 95 % CI = 2.32-15.83). Drinkers of 141-280 gm / week had 3.41 times (95 % CI = 1.64-7.09) and drinkers of 1-140 gm / week had 2.99 times (95 % CI = 1.72-5.19) higher risk of essential hypertension than non drinkers. (Table 11)

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Table 11. Association between behavior of alcohol consumption and essential hypertension.

Alcohol consumption	Case n=151		Control n=151		Crude OR*	95 % CI	*p*-value
	N	%	N	%			
Drinking status							
Non drinker**	33	21.9	76	50.3	1		
Former-drinker	16	10.6	12	7.9	2.76	1.16-6.56	0.021
Current-drinker	102	67.5	63	41.7	3.48	2.06-5.86	<0.001
Duration of alcohol consumption (year)**							
1-10	8	5.3	7	4.6	2.92	0.96-8.91	0.059
11-20	51	33.8	36	23.8	3.33	1.84-6.03	<0.001
≥ 21	59	39.1	32	21.2	3.55	1.81-6.93	<0.001
Frequency per week (day)**							
<1	30	19.9	26	17.2	2.65	1.36-5.15	0.004
1-2	67	44.4	39	25.8	3.66	2.05-6.54	<0.001
3-4	21	13.9	10	6.6	4.31	1.79-10.35	0.001
Quantity of alcohol consumption per week (gm)**							
1-140	68	45.0	50	33.1	2.99	1.72-5.19	<0.001
141-280	30	19.9	18	11.9	3.41	1.64-7.09	0.001
≥ 281	20	13.2	7	4.6	6.06	2.32-15.53	<0.001

Note ** Adjusted for age*

*** reference group was non drinker.*

Compared with subjects who did not drink alcohol in each level by frequency of alcohol consumption, there was an increased risk of essential hypertension. Drinkers who drank 3 or 4 days per week on quantity 281 gm or more had the highest risk compared to non drinkers (OR = 13.79, 95 % CI = 2.93-64.95). Drinkers who took 1 or 2 days per week on quantity 141 to 280 gm had 3.67 times (95 % CI = 1.64-8.25), drinkers who took 1 or 2 days per week on quantity 1 to141 gm / week had 3.75 times (95 % CI = 1.89-7.43) and drinkers who took less than once a week on quantity 1 to140 gm / week had 2.57 times (95 % CI = 1.31-5.02) higher risk of essential

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hypertension than non drinkers. There was a statistically significant association between alcohol consumption and essential hypertension. (Table 12)

Table 12 Odd ratios*, 95% confidence intervals, and numbers of cases and controls in each quantity by frequency category alcohol consumption.

Quantity of alcohol consumption per week (gm)	Frequency per week (day)			
	Non-drinker	<1	1–2	3-4
Non drinker**	1 (33/76)	-	-	-
1-140	-	2.57(1.31-5.02) (29/26)	3.75(1.89-7.43) (37/21)	1.24(0.19-8.04) (2/3)
141-280	-	- (1/0)	3.67 (1.64-8.25) (23/13)	2.35 (0.65-8.46) (6/5)
≥ 281	-	- (0/0)	2.96(0.87-10.10) (7/5)	13.79(2.93-64.95) (13/2)

Note ** Adjusted for age*

*** Reference group*

2.2 Total cholesterol

In table 13, univariate analysis of total cholesterol was conducted among groups with < 200 mg./100 ml as the reference category. Total cholesterol increased risk of essential hypertension but the difference was not statistically significant. Odds ratio in each level of total cholesterol were as follow : total cholesterol 200 – 239 mg./100 ml; OR = 1.10, 95 % CI = 0.65-1.86 and total cholesterol ≥ 240 mg./100 ml; OR = 1.27, 95 % CI = 0.62-2.57.

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Table 13. Association between total cholesterol (TC) and essential hypertension

Category	Case n=151		Control n=151		Crude OR*	95 % CI	*p*-value
	N	%	N	%			
Total cholesterol (mg/100ml)							
< 200**	87	57.6	93	61.6	1		
200 – 239	43	28.5	41	27.2	1.10	0.65-1.86	0.7228
≥ 240	21	13.9	17	11.3	1.27	0.62-2.57	0.5140
Mean (SD)	196.5	(39.66)	196.9	(33.33)			

** Adjusted for age*

*** Reference category*

2.3 Body mass index (BMI)

The majority of body mass index in the cases was overweight group (63.6 %) whereas the majority of body mass index in the controls was normal weight group (50.3 %).The second largest groups were normal weight in the cases and over weight group in the controls (33.8 % and 48.3 % respectively). The mean of body mass index of cases and controls groups were 24.08 kg./m^2 (SD = 3.29) and 23.54 kg./m^2 (SD = 2.93), respectively. Over weight persons had 1.86 times (95 % CI = 1.16-2.99) higher risk of essential hypertension than normal weight persons. (Table 14)

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Table 14. Association between body mass index (BMI) and essential hypertension

Category	Case n=151		Control n=151		Crude OR*	95 % CI	*p*-value
	N	%	N	%			
BMI (kg./m^2)							
18.5– 22.99** [a]	51	33.8	76	50.3	1		
< 18.5[b]	4	2.6	2	1.3	2.52	0.44-14.54	0.302
≥ 23[c]	96	63.6	73	48.3	1.86	1.16-2.99	0.009
Mean (SD)	24.08	(3.29)	23.54	(2.93)			

** Adjusted for age*

*** reference category*

[a] *Normal weight*

[b] *Under weight*

[c] *Over weight*

2.4 The family history of hypertension

The proportion family history of hypertension were higher in cases than in the controls (52.3 % and 39.1 % respectively). The present of family history of hypertension had a significant association with essential hypertension (OR = 1.84, 95 % CI = 1.15-2.93). (Table 15)

Table 15. Association between the family history of hypertension and essential hypertension

The family history [a]	Case n=151		Control n=151		Crude OR*	95 % CI	*p*-value
	N	%	N	%			
Absent **	72	47.7	92	60.9	1		
Present	79	52.3	59	39.1	1.84	1.15-2.93	0.010

[a] *The family history of hypertension was defined as hypertension among the first – degree relative (parents, siblings, and offspring)*

* *Adjusted for age*

** *Reference category*

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2.5 Smoking

The majority of case and control groups were non- smokers (74.2 % and 84.1 %, respectively). The second largest group were former-smokers (20.5 % and 13.2 % respectively). Therefore, the smoking status had no significant association with essential hypertension. The table 16 shows that the odd ratio of former-smoker was 1.46 (95 % CI = 0.76-2.78), whereas the odd ratio of current smoker was 2.00 (95 % CI = 0.57-6.91).

Table 16. Association between behavior of smoking and essential hypertension

Behaviour	Case n=151		Control n=151		Crude OR	95 % CI	*p*-value
	N	%	N	%			
Smoking							
Non– smoker*	112	74.2	127	84.1	1		
Former–smoker	31	20.5	20	13.2	1.46	0.76-2.78	0.255
Current– smoker	8	5.3	4	2.6	2.00	0.57-6.91	0.273

* *Adjusted for age*

** *Reference category*

2.6 Physical activity

The majority of case and control groups had active physical activity (90.7 % and 89.4 %, respectively). The active physical activity had no significant association with essential hypertension. The odd ratio was 0.76 (95 % CI = 0.35-1.65). (Table 17)

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Table 17. Association between behavior of exercise and essential hypertension

Behavior	Case n=151		Control n=151		Crude OR*	95 % CI	*p*-value
	N	%	N	%			
Physical activity [(a)]							
Active **	137	90.7	135	89.4	1		
Inactive	14	9.3	16	10.6	0.76	0.35-1.65	0.493

Note : [(a)] Physical activity included exercise for at least 30 minutes and at least Three days per week or as *bodily movements produced by the contraction of skeletal muscles : occupational, household, leisure time*

** Adjusted for age*

*** Reference category*

Levels of consumption

Levels of consumption of food such as fat-rich-food, total fiber food and salty food per week were calculated into three levels. Pooled mean were used in this study.

- High ; ≥ mean + standard deviation (SD)
- Medium ; mean interval between high and low
- Low ; ≤ mean - standard deviation (SD)

The cut off point were shown in the Appendix.

2.7 Fat-rich-food

Fat-rich-food factor was categorized into low, medium and high intakes. For fat-rich-food, low, medium and high intakes in the cases were 6.6 %, 84.1 % and 9.3 % respectively. In controls; low, medium and high intakes were 12.6 %, 76.8 % and 10.6 % respectively. There was an association between fat food and essential hypertension but not statistically significant, OR medium = 2.06 (95%CI = 0.92 - 4.*63*, *p-value* = 0.079), OR high = 1.84 (95%CI = 0.64 – 5.33, *p-value* = 0.258). (Table 18)

2.8 Total fiber food

Total fiber food was categorized into low, medium and high intakes but low level group cannot be analyzed because there was a zero cell in case groups, so total

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fiber food was categorized into medium (low level combined with medium level) and high intakes. Medium and high intakes in the cases were 97.4 % and 2.6 % respectively. In controls the consumption of medium and high were 78.8 % and 21.2 % respectively. There was a statistically significant association between total fiber food and essential hypertension , OR=9.1 (95%CI = 3.12 – 26.54, *p-value* < 0.001). (Table 18)

2.9 Salty food

Regarding salty food factor in this study, salty food were measured by taste diet and frequency of salty diet consumption. Taste diet was determined by the question, “What taste diet to prepared food before eating ?”. It was categorized into two levels (low level : spicy, sour, sweet, insipid and high level : salty). Frequency of salty consumption was determined by the question “How often do you have salty consumption? ”. It was categorized into three levels (low, medium and high).

Finally, salty food was the combination of taste diet and frequency of salty consumption and then it was categorized into three levels. Low, medium and high in the case groups were 8.6 %, 41.1 % and 50.3 % respectively. In control groups the low, medium and high were 18.5%, 57.6 % and 23.8 % respectively. High level, there was a statistically significant association between salty diet and essential hypertension, (OR = 4.49, 95%CI = 2.07-9.76, *p-value* < 0.001). Whereas medium level was not a statistically significant, (OR = 1.49, 95%CI = 0.71-3.14, *p-value =0.285*). (Table 18)

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Table 18. Association between behavior of dietary pattern and essential hypertension

Dietary pattern	Case n=151		Control n=151		Crude OR*	95 % CI	*p*-value
	N	%	N	%			
Consumption of food (time/week)							
Fat-rich-food[a]							
Low **	10	6.6	19	12.6	1		
Medium	127	84.1	116	76.8	2.06	0.91-4.63	0.079
High	14	9.3	16	10.6	1.84	0.64-5.33	0.258
Fiber food[b]							
High**	4	2.6	32	21.2	1		
Medium	147	97.4	119	78.8	9.1	3.12-26.55	<0.001
Salty food[c]							
Low**	13	8.6	28	18.5	1		
Medium	62	41.1	87	57.6	1.49	0.71-3.14	0.285
High	76	50.3	36	23.8	4.49	2.07-9.76	<0.001

Note * *Adjusted for age*

** *Reference group.*

[a] *Classified by using mean ± SD; low level ≤ mean –SD, medium level : mean interval between high and high level ≥ mean + SD*

[b] *low level group cannot be analyzed because there was a zero cell in case groups, so total fiber food was categorized into medium (low level combined with medium level) and high intakes*

[c] *Low level mean low level of taste diet and low level of salty consumption*

Medium level mean medium of salty consumption

High level mean high level of taste diet and high level of salty consumption

2.10 Type A Behavior

The majority of cases and controls had Type A Behavior (75.5 % and 65.6 %, respectively). The Type A Behavior had significant association with essential

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hypertension. The odd ratio was 1.66 (95 % CI = 1.00-2.76, *p-value* = 0.049). (Table 19)

Table 19. Association between Type A Behavior and essential hypertension

Category	Case n=151		Control n=151		Crude OR*	95 % CI	*p*-value
	N	%	N	%			
Non-typeA behavior**	37	24.5	52	34.4	1		
Type A behavior [a]	114	75.5	99	65.6	1.66	1.0-2.76	0.049
Mean (SD)	6.15	(1.3)	5.95	(1.65)			

Note * *Adjusted for age*

** *Reference group*

[a] *Type A persons are defined as persons who had scores higher than 50 percent.*

Detection of potential confounders in relationship between alcohol consumption and essential hypertension.

The literature reviews showed that there were association between essential hypertension and several factors. For this study, only 5 potential risk factors were identified ; history of essential hypertension in family, salty diet, total fiber diet, body mass index (BMI) and Type A behavior. All of these variables showed a significant association with essential hypertension. Therefore these factors, as well as age were brought for further analysis as potential confounders. Although in this study the subjects were matched for age, the matching scheme was quite loose (within 5 year intervals), therefore there might be residual confounding effect of age which needs further control. The investigator analyzed the association between alcohol consumption and essential hypertension via the evaluation of the role of each potential confounders and made adjustment for appropriate confounding factors.

Alcohol consumption was the study variable in relation to the risk of developing essential hypertension. All potential confounders were included in logistic regression analysis and this model was used as the full model (a total of 7 independent

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variables). Reduced model equals full model with a potential confounder (one at a time) deleted. Thus, there were 6 reduced models. Each reduced model was aimed at the evaluation of confounding effect of the dropped potential confounder.

The potential confounders were :

- Age (years)
- History of essential hypertension in family
- Salty food
- Total fiber food
- Body mass index (BMI)
- Type A behavior

The criteria for examining the presence of confounding effect was;confounding effect was considered as present if OR (alcohol drinking) in full model and reduced model (OR (alcohol drinking) not adjusted for that factor) differs by 15 % . (Table 20)

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Table 20 Evaluation of confounding effect of potential confounders in the risk of alcohol consumption related to essential hypertension.

Potential Confounders	OR of ex-alcohol consumption			OR of current alcohol consumption		
	Full model*	Reduced model**	Change in OR (%)	Full model*	Reduced model**	Change in OR (%)
Age	2.04	2.22	8.96	2.45	2.63	7.19
BMI	2.04	2.12	3.79	2.45	2.55	3.77
Essential hypertension in family	2.04	2.15	5.65	2.45	2.48	0.92
Total fiber food	2.04	2.45	20.15***	2.45	2.82	15.04***
Salty food	2.04	2.03	0.65	2.45	2.72	10.34
Type A behavior	2.04	2.05	0.78	2.45	2.57	4.83

Note: * *Full model include alcohol consumption status , age, BMI, history of essential hypertension in family ,total fiber food, salty food, Type A behavior*

** *Reduced model equals full model with specific variable deleted*

*** *The criteria of change > 15 % was used for classification of confounders.*

The analysis showed that only total fiber food was a potential confounders and must be controlled in further in the binary logistic regression analysis.

3. The multivariate analysis

3.1 The multivariate analysis for the association between alcohol consumption and essential hypertension by controlling confounders.

From the univariate analysis, the increased risk of essential hypertension were found to be associated with alcohol drinking status, duration of drinking (year), frequency of drinking (day) and quantity of drinking (gm).

Total fiber diet was found to be a potential confounder in this study, and it was controlled for in final logistic regression analysis.

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The alcohol consumption factors which remained significant in multivariate analysis were ;

Alcohol drinking status

There was a statistically significant association between alcohol drinking status and essential hypertension. Current drinkers had the highest risk compared to non drinkers (ORadj = 2.99, 95 % CI = 1.74 - 5.15). Whereas, former-drinkers had 2.25 times (95 % CI = 0.93-5.44) higher risk of essential hypertension than non drinkers but not significant. (Table 21)

Duration of alcohol intake (years)

Duration of alcohol drinking of $\geq$ 21years had the highest risk compared to non drinkers (ORadj = 3.08, 95 % CI = 1.53 - 6.17). Drinkers of 11-20 years had 2.86 times (95 % CI = 1.55 - 5.27) higher risk of essential hypertension than non drinkers. There was a statistically significant association between duration of alcohol drinking and essential hypertension. Whereas drinkers of 1-10 years had no statistically significant (ORadj=2.35, 95 % CI = 0.75 – 7.34). (Table 21)

Frequency of alcohol consumption (days / week)

There was a statistically significant association between frequency of alcohol consumption and essential hypertension. There was a dose-response relationship. Drinkers who drank 3-4 days / week had t he highest risk compared to non- drinkers (ORadj = 3.56, 95 % CI = 1.45-8.73). Drinkers of 1-2 days / week had 3.06 times (95 % CI = 1.68-5.5) and drinkers of < 1 days week had 2.37 times (95 % CI = 1.19-4.73) higher risk of essential hypertension than non –drinkers. (Table 21)

Quantity of alcohol consumption per week (gm)

There was a statistically significant association between quantity of alcohol consumption and essential hypertension. There was a dose-response relationship. Drinkers who drank $\geq$ 281 gm / week had the highest risk compared to non drinkers (ORadj = 4.64, 95 % CI = 1.76-12.25). Drinkers of 141-280 gm / week had 2.97 times (95 % CI = 1.39-6.32) and drinkers of 1-140 gm / week had 2.59 times

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(95 % CI = 1.46-4.58) higher risk of essential hypertension than non drinkers. (Table 21)

Table 21 Multivariate logistic regression analysis of association alcohol consumption and essential hypertension

Drinking status	Crude OR*	Adjusted OR**	95 % CI for adjusted OR**	*p*-value
Non drinker***	1	1		
Former drinker	2.76	2.25	0.93-5.44	0.073
Current drinker	3.48	2.99	1.74-5.15	<0.001
Duration of alcohol consumption (year)				
1-10	3.34	2.35	0.75-7.34	0.142
11-20	3.45	2.86	1.55-5.27	<0.001
≥ 21	4.61	3.08	1.53-6.17	0.002
Frequency per week (day)				
<1	2.65	2.37	1.19-4.73	0.015<0.
1-2	3.66	3.06	1.68-5.58	001
3-4	4.31	3.56	1.45-8.73	0.006
Quantity of alcohol consumption per week (gm)				
1-140	2.99	2.59	1.46-4.58	0.001
141-280	3.41	2.97	1.39-6.32	0.005
≥ 281	6.06	4.64	1.76-12.25	0.002

Note * *Adjusted for age*
** *Adjusted for total fiber diet and age*
*** *Reference group was non- drinker.*

Compared with subjects who did not drink alcohol in each level by frequency of alcohol consumption. There was a dose-response relationship. There was an increased risk of essential hypertension by level of frequency of drinking, drinkers who drank 3 or 4 days per week on quantity 281 gm or more had the highest risk compared to non drinkers (ORadj = 10.54, 95 % CI = 2.23-49.93). Drinkers who took 1 or 2 days per week on quantity 141 to 280 gm / week had 3.15 times (95 % CI = 1.37-7.22), drinkers who took 1 or 2 days per week on quantity 1 to 140 gm / week

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had 3.17 times (95 % CI = 1.57-6.39) and drinkers who took less than once a week on quantity 1 to140 gm / week had 2.29 times (95 % CI = 1.15-4.59) higher risk of essential hypertension than non drinkers. There was a statistically significant association between alcohol consumption and essential hypertension. Whereas, who took 3 or 4 days per week on quantity 1 to 140 gm / week had 0.98 times (95 % CI = 0.15-6.38), drinkers who took 3 or 4 days per week on quantity 141 to 280 gm / week had 2.13 times (95 % CI = 0.57-7.99) and who took 1 or 2 days per week on quantity 281 gm or more had 2.27 times (95 % CI = 0.66-7.79) higher risk of essential hypertension than non drinkers but the association was not statistically significant. (Table 22)

Table 22. Adjusted odds ratios*, 95% confidence intervals, and numbers of cases and controls in each quantity by frequency category alcohol consumption.

Quantity of alcohol consumption per week (gm)	Frequency per week (day)			
	Non-drinker	<1	1–2	3-4
Non drinker**	1 (33/76)	-	-	-
1-140	-	2.29(1.15-4.59) (29/26)	3.17(1.57-6.39) (37/21)	0.98(0.15-6.38) (2/3)
141-280	-	- (1/0)	3.15 (1.37-7.22) (23/13)	2.13 (0.57-7.99) (6/5)
≥ 281	-	- (0/0)	2.27(0.66-7.79) (7/5)	10.54(2.23-49.93) (13/2)

Note ** Adjusted for total fiber diet and age.*

*** Reference group.*

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3.2 The multivariate analysis for the association between alcohol consumption and essential hypertension by controlling conventional confounders.

From the multivariate analysis, the increased risk of essential hypertension were found to be associated with alcohol drinking status, duration of drinking (year), frequency of drinking (day) and quantity of drinking (gm).

When adjusted for age, total fiber food, BMI, history of essential hypertension in family, salty food, Type A behavior, smoking and educational level. Alcohol consumption factors which remained significant in multivariate analysis were as follows.

Alcohol drinking status

Current drinkers had 2.27 times (95 % CI = 1.13-4.56) higher risk of essential hypertension than non drinkers, and was statistically significant. Whereas, former-drinkers had 1.39 times (95 % CI = 0.49-3.90) higher risk of essential hypertension than non drinkers but it did not reach statistical significance. (Table 23)

Duration of alcohol intake (years)

There was a dose-response relationship. Duration of alcohol drinking of > 20 years had the highest risk compared to non drinkers (ORadj = 2.47, 95 % CI = 1.05-5.84). Drinkers of 11-20years had 2.23 times (95 % CI = 1.01-4.91) higher risk of essential hypertension than non drinkers. It was statistically significant. Whereas drinkers of 1-10 years had no statistical significance (ORadj=0.93, 95 % CI = 0..25-3.41). (Table 23)

Frequency of alcohol consumption (days / week)

Frequency of alcohol consumption, drinkers who drank 3-4 days / week had 3.38 times (95 % CI = 1.06-10.79) higher risk of essential hypertension than non drinkers. It was statistically significant. Whereas, drinkers of 1-2 days / week had 2.08 times (95 % CI = 0.97-4.45) and drinkers of < 1 days week had 1.77 times (95 % CI = 0.76-4.12) higher risk of essential hypertension than non–drinkers but the association was not statistically significant (Table 23)

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Quantity of alcohol consumption per week (gm)

Drinkers who drank ≥ 281 gm / week had 8.87 times (95 % CI = 2.34-33.59) higher risk of essential hypertension than non drinkers. It was statistically significant. Whereas, drinkers of 141-280 gm / week had 2.19 times (95 % CI = 0.83-5.75), drinkers of 1-140 gm / week had 1.70 times (95 % CI = 0.84-3.47) higher risk of essential hypertension than non drinker but it did not reach statistical significance. (Table 23)

Table 23 Multivariate logistic regression analysis of association alcohol consumption and essential hypertension adjusted by age, total fiber food, BMI, history of essential hypertension in family, salty food, Type A behavior, smoking and educational

Drinking status	Crude OR*	Adjusted OR**	95 % CI for adjusted**	*p*-value
Non drinker***	1	1		
Former drinker	2.76	1.39	0.49-3.90	0.529
Current drinker	3.48	2.27	1.13-4.56	0.021
Duration of alcohol consumption (year)				
1-10	3.34	0.93	0.25-3.41	0.916
11-20	3.45	2.23	1.01-4.91	0.046
≥ 21	4.61	2.47	1.05-5.84	0.039
Frequency per week (day)				
<1	2.65	1.77	0.76-4.12	0.187
1-2	3.66	2.08	0.97-4.45	0.059
3-4	4.31	3.38	1.06-10.79	0.039
Quantity of alcohol consumption per week (gm)				
1-140	2.99	1.70	0.84-3.47	0.143
141-280	3.41	2.19	0.83-5.75	0.113
≥ 281	6.06	8.87	2.34-33.59	0.001

*Note * Adjusted for age*

*** Adjusted for age, total fiber food, BMI, history of essential hypertension in family, salty food, Type A behavior, smoking and educational*

**** Reference group was non- drinker.*

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When adjusted for age, total fiber food, BMI, history of essential hypertension in family, salty food, Type A behavior, smoking and educational level compared with subjects who did not drink alcohol, there was a dose-response relationship between amount of alcohol consumption and essential hypertension. Drinkers who drank 3 or 4 days per week on quantity 281 gm or more had the highest risk compared to non drinkers (ORadj = 15.14, 95 % 2.18-105.07). Drinkers who took 1 or 2 days per week on quantity 281 gm or more / week had 5.78 times (95 % CI = 1.13-31.05) higher risk of essential hypertension than non drinkers. There was a statistically significant association between alcohol consumption and essential hypertension. Whereas, drinkers who took <1 days per week on quantity 1 to140 gm / week had 1.78 times (95 % CI = 0.75-4.21), drinkers who took 1-2 days per week on quantity 1 to 140 gm / week had 1.78 times (95 % CI = 0.75-4.22), drinkers who took 3 or 4 days per week on quantity 1 to 140 gm / week had 0.88 times (95 % CI = 0.08-10.02), drinkers who took 1 or 2 days per week on quantity 141 to 280 gm / week had 2.34 times (95 % CI = 0.80-6.81) and drinkers who took 3 or 4 days per week on quantity 141 to 280 gm / week had 1.63 times (95 % CI = 0.32-8.31) higher risk of essential hypertension than non drinkers but it did not reach statistical significance. (Table 24)

Table 24. Adjusted odds ratios*, 95% confidence intervals, and numbers of cases and controls in each quantity by frequency category alcohol consumption.

Quantity of alcohol consumption per week(gm)	Frequency per week (day)			
	Non-drinker	<1	1–2	3-4
Non drinker**	1 (33/76)	-	-	-
1-140	-	1.78(0.75-4.21) (29/26)	1.78(0.75-4.22) (37/21)	0.88(0.08-10.02) (2/3)
141-280	-	- (1/0)	2.34(0.80-6.81) (23/13)	1.63(0.32-8.31) (6/5)
≥ 281	-	- (0/0)	5.78(1.11-31.05) (7/5)	15.14(2.18-105.07)(13/2)

***** *Adjusted for age, total fiber diet, BMI, history of essential hypertension in family, salty diet, Type A behavior, smoking and educational level.*

** *Reference group.*

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CHAPTER 5
DISCUSSION

Study design and methodology

This study is a hospital-based case-control study which was conducted to determine the relationship between alcohol consumption and essential hypertension. The case and control groups were patients who came to Out Patient Department of Pua hospital and were interviewed using structured questionnaire. The use of hospital controls instead of population controls might affect the size of estimated effects of risk factors. The advantages in using hospitalized controls is that they are easily identified and readily available in sufficient number, thus minimizing the costs and effort involved in their assembly.

Data were collected through structured questionnaire to determine the history of exposure. All of cases were diagnosed before interview within one year period. Information bias due to misclassification on time of exposure might have occurred in this study. The prospective cohort study of newly diagnosed cases would be better in controlling this kind of bias. However, it would be harder to conduct because longer follow up time is needed. Morever, the identification of small number of hypertension cases within a large cohort would consume a high resource of time and budget, which make such study impossible.

New cases (within one year of diagnosis) were included in this study for advantages that an incident case normally recalls better than a prevalent case regarding the experiences or exposures under evaluation.

This study had some limitations due to the method in selecting control groups. Majority of controls were persons who came for annual physical check up because in this study, all subjects must have the total cholesterol variable. So, the socioeconomic

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status in cases and controls were different that the OR may be over estimate. Therefore, this group could be considered as healthy control, not the hospital control.

Finally, this study contained no direct observation on behavior. All of information was obtained from the interview. The information bias might occurred. To minimize this bias, before interview, the interviewer had explained to subjects about the significance of this study. Let them know their information was important for this study, but subjects were blinded to the study objectives and hypotheses. Therefore, this should also reduce recall bias.

Study results

Evaluation of confounding effect showed that only total fiber food was the confounding factors because the OR of alcohol drinking in full model and reduced model was changed more than 15 percents. Thus, total fiber diet and age were controlled for in final logistic regression analysis. Another model adjusted for 8 potential confounding factors were also offered in order to make the result comparable to other studies. However, the discussion is the result would be on the model with proven confounding factors. It showed be noted that, even though other 6 confounding factors, among which , individually, was proved as a non-confounder, when they are controlled simultaneously, the adjusted ORs were changed quite dramatically. Therefore, the method of individually evaluated confounders might not be a good criteria. The studied results were presented as follows.

Status of alcohol consumption.

The results of this study showed that current status of alcohol consumption was associated with increased risk for developing essential hypertension, with odd ratio increased to 2.99 time (95 % CI = 1.74-5.15) higher risk of essential hypertension than non drinkers by multiple logistic regression analysis, after balancing for sex, age and controlled by total fiber food as potential confounder. Whereas, former-drinkers had no statistically significant (ORadj=2.25, 95%CI=0.93-5.44). This result corresponded with other studies, but the risk estimated for essential hypertension were

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different. Nakanishi et al (33) in a longitudinal study showed that the relative risk for hypertension in current drinkers versus non-drinkers was stronger among men with a BMI less than 24.2 kg/m^2 than among men with a BMI 24.2 kg/m^2 or more after controlling for potential predictors of hypertension. Fuchs et al (34) in a cohort study showed that there was an increased risk of hypertension in those who consumed large amounts of ethanol compared with those who did not consumed alcohol over the 6 years of follow-up. The adjusted odds ratio were 2.02 (95% CI,1.08-3.79) for white women, and 2.31 (95% CI, 1.11-4.86) for black men. Leyatikul (41) in a case-control study showed that after adjusting for potentially confounding factors, the significant risk factor was alcohol consumption (OR = 2.49, 95 % CI = 1.40- 6.20). Jo et al (46) in a cross-sectional survey using multivariate logistic regression analysis showed that alcohol intake was independent risk factor of hypertension (OR=1.34, 95%CI =1.11 –1.61)

In contrast to the above, in Thailand, Voravong et al (8) by an analytic cross-sectional study showed that after adjusting for potentially confounding factors, alcohol consumption did not increase the prevalence of hypertension (OR = 1.87, 95 % CI = 0.60-5.84). Pauvilai, Laorakpongse (48) in a cross-sectional survey showed that alcohol intake was found not to be independent risk factors for hypertension (OR=1.47, *p* =0.132).

Duration of alcohol consumption.

There was a statistically significant association between duration of alcohol drinking and essential hypertension. Duration of alcohol drinking of $\geq$ 21years had the highest risk compared to non drinkers (ORadj = 3.08, 95 % CI = 1.53-6.17). Drinkers of 11-20 years had 2.86 times (95 % CI = 1.55 - 5.27) higher risk of essential hypertension than non drinkers, whereas drinkers of 1-10 years had no statistically significant (ORadj=2.35, 95 % CI = 0.75 – 7.34).

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Frequency of alcohol consumption.

There was a statistically significant association between frequency of alcohol consumption and essential hypertension. There was a dose-response relationship. Drinkers who drank 3-4 days / week had the highest risk compared to non- drinkers (ORadj = 3.56, 95 % CI = 1.45-8.73). Drinkers of 1-2 days / week had 3.06 times (95 % CI = 1.68-5.58) and drinkers of < 1 days week had 2.37 times (95 % CI = 1.19-4.73) higher risk of essential hypertension than non–drinkers.

In contrast to the above, in Thailand, Swaddiwudhipong et al. (9) in an analytic cross-sectional study showed that the general Thai communities had a higher proportion of daily alcohol drinkers (6.5%) than Thai-yai (5.7%), whereas the prevalence of hypertension was significantly higher in the Thai-yai communities (24.2%) than in the general Thai communities (15.6%).

Quantity of alcohol consumption.

There was a statistically significant association between quantity of alcohol consumption and essential hypertension. There was a dose-response relationship. After balancing for sex, age and controlled by total fiber food as potential confounder, drinkers who drank $\geq$ 281 gm / week had the highest risk compared to non drinkers (ORadj = 4.64, 95 % CI = 1.76-12.25). Drinkers of 141-280 gm / week had 2.97 times (95 % CI = 1.39-6.32) and drinkers of 1-140 gm / week had 2.59 times (95 % CI = 1.46-4.58) higher risk of essential hypertension than non drinkers. This result corresponded with other studies, but the risk estimated for essential hypertension were different. Nakanishi et al (33) in a longitudinal study showed that after controlling for potential predictors of hypertension, the relative risk for hypertension compared with non-drinkers was 1.52 (95% CI, 1.05-2.19) for persons who drank 0.1 – 22.9 g/day of ethanol, 1.81 (95%CI, 1.29-2.54) for persons who drank 23 – 45.9 g/day of ethanol, 2.12 (95% CI, 1.53-2.94) for persons who drank 46 – 68.9 g/day of ethanol and 2.48(95% CI, 1.75-3.52) for persons who drank more than 68.9 g/day of ethanol (test for trend, $P < 0.001$). Fuchs et al (34) in a cohort study showed that there was an increased risk of hypertension in those who consumed large amounts of ethanol

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(≥ 210 g per week) compared with those who did not consumed alcohol over the 6 years of follow-up. The adjusted odds ratio were 1.2 (95% CI, 0.85-1.67) for white men, 2.02 (95% CI,1.08-3.79) for white women, and 2.31 (95% CI, 1.11-4.86) for black men. At low to moderate level of alcohol consumption (1 to 209 g per week), the adjusted odds ratio (95% confidence interval) were 0.88 (0.71-1.08) for white men, 0.89 (0.73-1.09) for white women , 1.71 (1.11-2.64) for black men and 0.88 (0.59-1.33) for black women. JNC VI study (13) showed that excessive alcohol intake is an important risk factor for high blood pressure, those who drink beverages containing alcohol should be counsel to limit their daily intake to no more than 1 oz (30 ml) of ethanol eg, 24 oz of beer, 10 oz of wine, or 2 oz of 100-proof whiskey. Xin et al (36) in a meta- analysis of randomized controlled trials showed that overall, alcohol reduction was associated with a significant reduction in mean (95% CI) systolic and diastolic blood pressure of –3.31 mmHg (-2.52 to –4.10 mmHg) and –2.04 mmHg (-1.49 to –2.58 mmHg), respectively. Moore et al (37) in a cross-sectional population-based household survey, a J shaped dose-response association was found with abstainers and heavy alcohol consumers having significantly higher blood pressures than moderate alcohol consumers (1 to 2 beverages per day). These data suggested that alcohol consumption is a potentially important risk factor for elevations in blood pressure and hypertension.

The multivariate analysis for the association between alcohol consumption and essential hypertension by controlling conventional confounders. According to the results of multivariated analysis, they showed the different magnitude of OR when controlled for age, total fiber diet, BMI, history of essential of hypertension in family, salty diet, Type A behavior, smoking and educational and controlled for age and total fiber diet alone (Table 22, Table 24). Even though in the evaluation of confounding effect of each variable, it were found that the only potential confounder in this study is total fiber diet (Table 20) the others were not. When all 8 conventional potential confounders were simultaneously controlled, the ORs had changed dramatically, especially in the group of high frequency of drinking (3-4 days / week) and high quantity of alcohol consumption (≥ 281 gm / week), in which the adjusted OR increase from 10.54 to 15.14.

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This difference showed that the confounding effect of multiple variables could be quite strong, even when each single variable showed no confounding effect. So the method of evaluation on confounding effect of each single variable might be inefficient and the interpretation of result might become invalid. The control of conventional (or known) risk factors might be necessary in such situation. However, this has an expense on the conclusion of result which would definitely be based on smaller samples in each cell. Interestingly, the width of confidence intervals showed the negative sign (confidence interval became width) when 8 confounders were controlled simultaneously as compared to 2 confounders.

In conclusion, these data suggested that alcohol consumption is a potentially important risk factor of development of essential hypertension.

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CHAPTER 6
CONCLUSION AND RECOMMENDATIONS

This case-control study was conducted to determine the relationship between alcohol consumption and essential hypertension. The data were collected by using questionnaires to interview and copied from the patients' medical record (OPD card). 151 of cases and 151 of controls the patients who received treatment at out patient department of Pua hospital, Nan Province and healthy subjects who came for annual physical check-up at out patient department of Pua hospital, during the period October 2002 to February 2003.

Cases and controls were matched by sex and age (within 5 years). The majority of cases and controls were female and between 40-49 years of age, were couple, were Buddhists, had finished elementary in case groups and finished vocational school or University in control groups, were agriculturists in case groups and government employee in control groups, had monthly income $\leq$ 5,000 baht in case group and 5,001-10,000 baht in control groups.

From the multivariate analysis for the association between alcohol consumption and essential hypertension by controlling potential confounders, it was shown that total fiber food was found to be potential confounders in this study, and they were controlled for in final logistic regression analysis. The alcohol consumption factors which remained significant in multivariate analysis were ; Current drinkers, duration of alcohol drinking of 11-20 years, drinkers of $\geq$ 21 years, drinkers who drank < 1 days week, drinkers of 1-2 days / week, drinkers of 3-4 days / week, drinkers who drank, drinkers of 1-140 gm / week, drinkers of 141-280 gm / week and drinkers of $\geq$ 281 gm / week that adjusted for total fiber diet and age. (Beer : ethanol 140 gm = 7 can, Mixed Liquor Thai : ethanol 140 gm = 20 glass (1 glass = 20ml)).

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For the effect of combination between frequency and quantity of drinking. The alcohol consumption factors which remained significant in multivariate analysis were drinkers who drank less than once a week on quantity 1 to140 gm / week, drinkers who took 1 or 2 days per week on quantity 1 to140 gm / week, drinkers who took 1 or 2 days per week on quantity 141 to 280 gm / week and drinkers who took 3 or 4 days per week on quantity 281 gm or more. There was also a clear tendency for dose response relationship.

The multivariate analysis for the association between alcohol consumption and essential hypertension by controlling conventional confounders. When adjusted for age, total fiber food, BMI, history of essential hypertension in family, salty diet, Type A behavior, smoking and educational level the alcohol consumption factors which remained significant in multivariate analysis were ; current drinkers, duration of alcohol drinking of 11-20 years and drinkers of $\geq$ 21years, drinkers who drank of 3-4 days / week, drinkers who drank of $\geq$ 281 gm / week.

For the effect of combination between frequency and quantity of drinking. The alcohol consumption factors which remained significant in multivariate analysis were drinkers who drank took 1 or 2 days per week on quantity $\geq$ 281 gm / week and drinkers who took 3 or 4 days per week on quantity 281 gm or more. When adjusted for age, total fiber diet, BMI, history of essential hypertension in family, salty diet, Type A behavior, smoking and educational level.

Recommendations

Based on the finding of this study, the following issues should be considered for improving the prevention of hypertension.

1. Public health organizations or non government organizations must do campaign for health promotion in order to modify lifestyle about alcohol consumption. Excessive alcohol intake is an important risk factor for high blood pressure.

2. A prevention control and health promotion for essential hypertension can be inferred from the above factors obtained from this study. The people should be informed about the knowledge an health care to avoid these risk factors. Health risk

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behaviors should be carefully monitored and modified through health education. The people can take care of themselves by ;

- The individual with a family history of hypertension should have their blood pressure checked regularly. They should aware of the importance of preventing hypertension and should be careful and avoid the risk factors of hypertension.
- Avoiding consuming high salty diet (high salty diet usually consists of sodium) because high sodium intake was associated with high blood pressure level.
- Avoiding emotional stress especially persons who have the type A behavior because emotional stress can affect the circulatory system. It can raise blood pressure acutely.
- Total fiber diet intake (from fresh fruits and vegetables) that was a protective factor for essential hypertension.
- Weight reduction. Excess body weight that body mass index of 25 or greater is correlated closely with increased blood pressure.

Nowadays, essential hypertension tends to be more common because of the change of environment and the lifestyle in the Thai society. Therefore, everybody should be careful and avoid the risk factor of hypertension.

Recommendations for further study

1. This kind of study should be repeated in other hospitals or even in other the communities in order to get the variations of risk factor more than in Hospital cases.
2. The further study may use other of research study such as cohort study on does-response relationship between alcohol consumption and essential hypertension.
3. A further study regarding complications of hypertension and cost per case should be done.
4. A further study regarding home health care for treatment and control of hypertension in community might be considered to reduced these complication.

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APPENDIX A
CONSENT FORM

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CONSENT FORM

Alcohol consumption related to essential hypertension in Nan Province

General Objective

To study risk factors associated with essential hypertension.

Specific Objectives

To study association between duration, frequency and quantity of Alcohol consumption on essential hypertension.

Participants will pass through the following maneuver :

Interview for personal information, around 15-20 minute by the research in private room for the participants ensure the data are secretiveness.

Significance of research

1. The result from this study is expected as information about the baseline data and factors contributing to essential hypertension especially alcohol consumption.
2. This knowledge can be utilized to develop the prevention and control measures of essential hypertension.
3. The result of this study about alcohol consumption can be used as a guideline for the development of health education program.

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CONSENT FORM

Date…….

Name is …….age…….years

Address…….

I have known the retails of research “Alcohol consumption related to essential hypertension “

If I have some questions or get side effect as the result of this investigation, I will contact to Mr. Kaset Pati at Pua hospital, Pua district, Nan. Immediately.

If the researcher has more information about advantage and disadvantage that related to this research, researcher will let me know as soon as possible.

I have the right to refuse the participation in this research and it is not a effected to the quality of service and treatment that I will get. I am assured by the researcher that my individual information will be well-covered and will not be posed to the public.

I knew the details and asked all questions I have and get satisfactory answers I am willing to participate in this research, answer a questionnaire thus I declare that I have signed without enforcement in front of the witness.

…….. Participant / instead of fair

(……..…)

…….. Researcher

(……..)

…….. Witness

(……)

…….. Witness

(……)

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APPENDIX B
QUESTIONNAIRE

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QUESTIONNAIRE

ID CODE ……..

HN…….Date of interview……../…….……./ 2545

1.Have you ever diagnosed or treated for disease of these ? (have) Exclude

- DM, heart, renal, primary hypertension and pregnancy.

2. Have you ever diagnosed or treated for disease of these ?(control group)(have)Exclude - Hepatitis, Peptic ulcer, and Cancer.

3.Name……

4.Status of sample ( ) Case ( ) control

Part 1. Personal information

1.1 Age……years, date/month/year of birth ……/……/……..

1.2 Gender 1.( )Male 2.( ) Female

1.3 Marital status

1.( )Single 2.( ) Couple 3.( ) Widowed 4.( ) Divorce

1.4 Region

1.( ) Buddha 2.( ) Christ 3.( ) Islam 4.( ) Other

1.5 Resident……

1.6 Education level

1.( ) Illiterate 2.( ) Elementary 3.( ) High school

4.( ) Vocational school 5.( ) University 6.( ) Other

1.7 Occupation

1.( ) Agriculturist 2.( ) Government employee

3.( ) Employee (labour) 4.( ) Household job 5.( ) Employee (office)

6.( ) Merchant 7.( )Other……

1.8 income……Baht /month

1.( ) <3,000.- 2.( ) 3,000-6,000

3.( ) 6,001-10,000 4.( ) 10,001-15,000 5.( ) >15,000

1.9 Heredity- Is there any hypertensive patient in your family ?

1.( ) No 2.( ) Yes, who is my……

2.1.( )Father 2.2.( )Mother 2.3.( ) Siblings 2.4.( ) Offspring.

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Part 2.History behavior data

2.1 Have you ever smoked cigarette ?

1.( )Never 2.( )Ex-smoker, smoking cessation…year (go to question 2.2)

3.( )Yes (go to question 2.2)

2.2 Frequency of smoking

1.( )Daily 2.( ) 3-4 time per week 3.( ) 1-2 time per week

4.( )< once a week

2.3 Number of cigarette per day…….

2.4 Type of cigarette

1.( )Hand-rolled 2.( ) Filtered 3.( ) Non-filtered 4.( ) Other

2.5 Duration of smoking…….years.

2.6 Have you ever exercised ? (example in question 2.7)

1.( ) Never (go to question 2.10)

2.( ) Ex-exercise (go to question 2.7)

3.( ) yes (go to question 2.7)

2.7 Kind of exercise usually

1.( ) lightly(walk, Tikek) 2.( ) Nearly moderate (fast walk,)

3.( )Moderate (jogging, bicycling) 4.( ) Nearly heavy(aerobic, batminton)

5.( )Heavy(run, swim)

2.8 Frequency of exercise usually per week

1.( )< 1 time 2.( ) 1-2 time 3.( ) 3 time

4.( )4-5 time 5.( )6-7 time

2.9 Duration of exercise

1.( )< 30 minute 2.( ) ≥ 30 minute

2.10 Job description was…….

1.( ) Sedentary

2.( ) Stand or walk continuous

3.( ) labour

2.11 Activity after work

1.( ) Sedentary

2.( ) Stand or walk continuous

3.( ) labour

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2.12 Do you drink alcohol ?

1.( ) Never (go to question 3.1)

2.( ) Ex-drinker, quitted alcohol ……years, total had drank…….years reasons for cessation ……

(go to question 2.13)

3.( ) Yes, age started drinking……years (go to question 2.13)

2.13 How you usually drink alcohol ?

2.13.1 Habitual drinking

Types of alcohol beverage	Frequency of drinking (day per week or month)		Amount of drinking per day
	Month (<1,1,2,3)	Week (1,2,3,4,5,6,7)	(<1,1,2,3,4,5,6,7,8,9, 10,….)
1.Local liquor (20ml)			
2.Mixed Liquor Thai (20ml)			
3.Beer (150ml)			
4.Mixed white Liquor Thai (20ml)			
5.Whisky / Brandy(20ml)			
6. Wine(150)			
8. Other……			

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2.13.2 Occasioning drinking

Types of alcohol beverage	Frequency of drinking (day per week or month)		Amount of drinking per day
	Month (<1,1,2,3)	Week (1,2,3,4,5,6,7)	(<1,1,2,3,4,5,6,7,8,9,10,.)
1.Local liquor (20ml)			
2.Mixed Liquor Thai (20ml)			
3.Beer (150)			
4.Mixed white Liquor Thai (20ml)			
5.Whisky /Brandy (20ml)			
6. Wine(150)			
8. Other……			

Note 1. Show glasses for comparative

2. glasses for Local liquor, Mixed Liquor Thai, Whisky / Brandy = 20 ml

3. glasses for beer and wine = 150 ml , 1 can beer = 330 ml

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Part 3.History dietary pattern

3.1 What taste diet to prepared food before eating ?"

1.spicy 2.sour 3.salty 4.sweet 5.insipid

3.2 How often do you have history dietary pattern? 1 month ago

Food item	Never consumed	Meal per month	**Meal per week**						
	0	1 - 3	1 - 3	4 - 6	7 - 9	10 - 12	13 - 15	16 - 18	19 - 21
Fat-rich-food									
1. Pork meat									
2. A fowl meat ex. skin									
3. Buffalo meat									
4. Fish									
5. Sausage									
6. Mooyor									
7. Chinese sausage									
8. Mincemeat mixed rice									
9.Giblet, animal brain									
10.Egg									
11.Coconut cream									
high fiber food									
1.Vegetable									
2. Fruit									
3.Cereal									
Salty diet									
1.Salted meat									
2.Salted fish									
3.Tom-yum-Thai									
4. Salted piccalilli									

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Part 4.Type A Behavior

Framingham Type A Questionnaire

The following is a list of several traits or qualities. For each one, please indicate whether each trait describes you very well, fairly well, somewhat, or not at all.

	Fairly Well	Somewhat	Not at all
1.Having a strong need to excell (be best in most things)	( )	( )	( )
2.Being bossy or dominating	( )	( )	( )
3.Usually feeling pressed for time	( )	( )	( )
4.Being hard driving and competitive	( )	( )	( )
5.Eating too quickly	( )	( )	( )
6.Do you get quite upset when you have to wait for anything	( )	( )	( )

Work outside the home

7.Now we want to know how you have generally felt at the end of an average day in your regular line of work. Have you often felt very pressed for time ?

Yes…1 No…0

8.Has your work often stayed with you so that you were thinking about it after working hours? Yes…1 No…0

9. Has your work often stretched you to the very limits of your energy and capacity?

Yes…1 No…0

10 Have you often uncertain, uncomfortable, or dissatisfied with how well you are doing in your regular line of work? Yes…1 No…0

Housework–for all people who have not worked outside the home most of their adult lives:

1.With regard to your housework: Have you felt pressed for time?

Yes…1 No…0

2.Have you often had feeling of dissatisfaction? Yes…1 No…0

3.Has your work often stayed with you so that you think about it all day?

Yes…1 No…0

4.In general, do you find housework a big strain? Yes…1 No…0

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Part 5.History of medical conditions (copy from medical record)

5.1 Date / Month / Year, get diagnosis ……./…….…….

5.2 Diagnosis……..

5.3 Weight …….kg.

5.4 Height …….cm.

5.5 Blood pressure Systolic ……mmHg

Diastolic ……mmHg

5.6 Blood chemistry

Total cholesterol (TC) ……mg./100 ml

HDL – C ……..……..… mg./100 ml

LDL – C ……..… mg./100 ml

Triglyceride (TG) ……mg./100 ml

Fasting blood sugar (FBS)…… mg./100 ml

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<u>แบบสัมภาษณ์ เรื่อง การดื่มเครื่องดื่มแอลกอฮอล์กับโรคความดันโลหิตสูงชนิดไม่ทราบสาเหตุ กรณีศึกษาที่ โรงพยาบาลสมเด็จพระยุพราชปัว อำเภอปัว จังหวัดน่าน พ.ศ.2545</u>

เลขที่แบบสัมภาษณ์ …….. เลขที่ทั่วไป(HN)……..

ว.ด.ป. ที่สัมภาษณ์ ……

1. ท่านเคยถูกวินิจฉัยด้วยโรคเหล่านี้หรือไม่
   เบาหวาน, โรคไต, หัวใจ, ความดันโลหิตสูงที่ทราบสาเหตุ,ตั้งครรภ์, โรคตับ, กระเพาะอาหาร มะเร็ง (ระบุโดยขีดเส้นใต้ข้อความ) หรือโรคประจำตัวอื่นๆระบุ……
2. ชื่อ – นามสกุล ผู้ตอบแบบสัมภาษณ์……
3. สถานะของผู้ตอบแบบสัมภาษณ์ ( ) กลุ่มศึกษา ( ) กลุ่มเปรียบเทียบ

ส่วนที่ 1. ข้อมูลทั่วไป

1.1 อายุเต็มในปัจจุบัน……ปี (ว/ด/ป. เกิด ……/……/…….)

1.2 เพศ 1.( ) ชาย 2.( ) หญิง

1.3 สถานภาพสมรส

1.( )โสด 2.( )คู่ 3.( )หม้าย 4.( )หย่า / แยก

1.4 ท่านนับถือศาสนาใด

1.( )พุทธ 2.( )คริสต์ 3.( )อิสลาม 4.( )อื่น ๆ ระบุ……..

1.5 สถานที่อยู่ บ้านเลขที่…….หมู่ที่……ชื่อบ้าน……ตำบล……
อำเภอ……จังหวัดน่าน

1.6 ระดับการศึกษาสูงสุดของท่าน

1.( ) ไม่ได้เรียน 2.( ) ประถมศึกษา 3.( ) มัธยมศึกษา
4.( ) อนุปริญญา 5.( ) ปริญญาตรี 6.( ) อื่นๆระบุ…

1.7 อาชีพหลักของท่านที่ทำรายได้ให้มากที่สุด ได้แก่

1.( ) เกษตรกร 2.( ) รับราชการ / รัฐวิสาหกิจ
3.( ) รับจ้าง(ใช้แรงงาน)…… 4.( ) งานบ้าน
5.( ) รับจ้าง(งานสำนักงาน) 6.( ) ค้าขาย / ธุรกิจส่วนตัว
7.( ) อื่นๆ ระบุ……

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1.8 รายได้ของท่าน ต่อเดือน ยังไม่หักรายจ่าย (ระบุ ประมาณ)……บาท

รายได้ของคู่สมรส ต่อเดือน ยังไม่หักรายจ่าย (ระบุ ประมาณ)…… …….บาท

1.9 ในครอบครัวของท่าน บิดา มารดา พี่ น้อง และ บุตร

มีการเจ็บป่วยด้วยโรคความดันโลหิตสูงหรือไม่

1.( ) ไม่มี 2.( ) มี ผู้ป่วยเป็น

2.1.( ) บิดา 2.2 ( ) มารดา 2.3 ( ) พี่ /น้อง 2.4 ( ) บุตร

เริ่มป่วยเมื่ออายุ……ปี

ส่วนที่ 2. ข้อมูลด้านพฤติกรรมในอดีต

2.1 ท่านสูบบุหรี่หรือไม่

1.( ) ไม่เคยสูบเลย (ข้ามไป ข้อ 2.5)

2.( ) เคยสูบ เมื่ออายุ……..ปี เลิกเมื่ออายุ……ปี (ถามต่อ ข้อ2.2)

3.( ) สูบอยู่ เริ่มสูบเมื่ออายุ……ปี (ถามต่อ ข้อ2.2)

2.2 ความถี่ในการสูบ 1.( ) ทุกวัน 2.( ) เว้นวัน

3.( ) สัปดาห์ละ1-2 วัน 4.( ) บางโอกาส

2.3 จำนวนมวนที่สูบต่อวัน……มวน

2.4 ชนิดบุหรี่ที่สูบ 1.( ) มวนเอง 2. ( ) มีก้นกรอง

3.( ) ไม่มีก้นกรอง

2.5 ท่านออกกำลังกายหรือไม่ (ยกตัวอย่าง รูปแบบการออกกำลังกาย ดังข้อ 2.6 ประกอบ)

1.( ) ไม่เคยออกกำลังกายเลย (ข้ามไปข้อ2.9)

2.( ) ออกกำลังกาย (ถามต่อข้อ2.6)

2.6 ส่วนใหญ่ท่านออกกำลังกายลักษณะ / ประเภทใด

1.( ) เบา(เดินช้าๆ/ไทเก๊ก) 2.( ) ค่อนข้างเบา(เดินเร็ว/วิ่งปานกลาง/วอลเลย์บอล)

3.( ) ปานกลาง(ขี่จักรยาน/จ๊อกกิ้ง) 4.( ) ค่อนข้างหนัก(เต้นแอโรบิก/แบดมินตัน)

5.( ) หนัก(วิ่งเร็ว/ว่ายน้ำ/จักรยานระยะไกล)

2.7 ความถี่ของการออกกำลังกายโดยเฉลี่ย สัปดาห์ละกี่ครั้ง

1.( ) น้อยกว่า 1 ครั้ง 2.( ) 1-2 ครั้ง 3.( ) 3 ครั้ง

4.( ) 4-5 ครั้ง 5.( )6-7ครั้ง

2.8 ระยะเวลาการออกกำลังกายแต่ละครั้ง

1.( ) น้อยกว่า 30 นาที 2.( ) มากกว่าหรือเท่ากับ 30 นาที

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2.9 ลักษณะงานที่ท่านทำประจำ คือ

1.( ) ทำงานนั่งโต๊ะ ในสำนักงาน / บริษัท / ที่นั่งเป็นส่วนมาก

2.( ) งานที่ต้องยืนหรือเดินต่อเนื่อง เช่นแม่บ้าน พนักงาน ที่ต้องยืนหรือเดินเป็นส่วนมาก

3.( ) งานที่ใช้แรงงานมาก เช่น งานก่อสร้าง เกษตรกรรม

2.10 ลักษณะกิจกรรมต่างๆที่ทำประจำ นอกเวลาทำงานประจำ

1.( ) นั่งเป็นส่วนมาก เช่น ดูโทรทัศน์/อ่านหนังสือ เป็นต้น

2.( ) กิจกรรมที่ต้องยืนหรือเดินต่อเนื่อง เช่นแม่บ้าน พนักงาน ที่ต้องยืนหรือเดินส่วนมาก

3.( ) งานที่ใช้แรงงานมาก เช่น งานก่อสร้าง เกษตรกรรม

2.11 ท่านดื่มเครื่องดื่มแอลกอฮอล์หรือไม่

1.( ) ไม่เคยดื่มเลย ข้ามไปข้อ 3.1

2.( ) เคย ดื่ม ปัจจุบันเลิกแล้ว เริ่มดื่มอายุ.....ปี เลิกดื่มเมื่ออายุ.....ปี

สาเหตุที่เลิก..... ถามต่อข้อ 2.12

3.( ) ดื่มอยู่ ท่านเริ่มดื่มเมื่ออายุ .....ปี ถามต่อข้อ 2.12

2.12 <u>ส่วนใหญ่</u> ท่านดื่มเครื่องดื่มแอลกอฮอล์อย่างไรบ้าง ในรอบ 2 ปีที่ผ่านมา หรือ ในอดีต

2.12.1 กรณีดื่มปกติ * (โปรดระบุตัวเลขลงในช่องว่าง)

ประเภทเครื่องดื่มแอลกอฮอล์	เฉลี่ยจำนวนวันที่ดื่ม เดือนละ กี่วัน (<1,1,2,3 ,4 ,5 ,6 ,7 ,...30วัน)	ปริมาณที่ดื่มต่อครั้ง (จอก,แก้ว,กระป๋อง) 1,2,3,4,5,6,7,8,...
1.สุรากลั่นพื้นบ้าน(จอก)		
2.สุราผสม (แก้ว) เช่น หงษ์ทอง หงษ์ไท แม่โขง		
3.เบียร์ (แก้ว)		
4. สุราขาวสรรพสามิต 35 ดีกรี (จอก)		
5. วิสกี้ /บรั่นดี (แก้ว)		
6. ไวน์ (แก้ว)		
7.อื่นๆ.....		

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2.12.2 กรณีดื่มในโอกาสพิเศษ** _(ระบุตัวเลขลงในช่องว่าง)

ประเภทเครื่องดื่มแอลกอฮอล์	เฉลี่ยจำนวนวันที่ดื่ม ต่อเดือน (<1,1,2,3 ,4 ,5 ,6 ,7 ,…30วัน)	ปริมาณที่ดื่มโดยเฉลี่ย ต่อครั้ง (1,2,3,4,5,6,7,8,9,...)
1.สุรากลั่นพื้นบ้าน(จอก)		
2.สุราผสม (แก้ว) เช่น หงษ์ทอง หงษ์ไท แม่โขง		
3.เบียร์ (แก้ว)		
4. สุราขาว35 ดีกรี (จอก)		
5. วิสกี้ /บรั่นดี (แก้ว)		
6. ไวน์ (แก้ว)		
7.อื่นๆ……		

2.12.3 กรณีดื่มโดยเฉลี่ยแล้วประมาณ <u>น้อยกว่า 24 ครั้ง ต่อปี</u>

ระบุจำนวนครั้ง …… ครั้ง (1 ถึง 23 ครั้ง)

หมายเหตุ

1.จอก มีปริมาณ = 20 ซีซี เท่ากับ 4 ฝาขวดเหล้าหงษ์ทอง โดยประมาณ

2.แก้ว สำหรับ สุราผสม วิสกี้ /บรั่นดี มีปริมาณ = 20 ซีซี เท่ากับ 4 ฝาขวดเหล้าหงษ์ทอง โดยประมาณ

3.แก้ว สำหรับ เบียร์และไวน์ มีปริมาณ = 150 ซีซี , เบียร์ 1 กระป๋อง = 330 ซีซี

4.ระบุเครื่องดื่มแอลกอฮอล์ที่มีการดื่มสูงสุดในแต่ละครั้ง ไม่เกิน 2 ชนิด

* ดื่มปกติ หมายถึง ดื่มเป็นประจำที่บ้าน หรือที่อื่นใด โดย ไม่ใช่ กรณีงานเทศกาลต่างๆ

** ดื่มในโอกาสพิเศษ หมายถึง งานเทศกาล เช่น งานแต่งงาน ขึ้นบ้านใหม่ บวช เทศกาล งานประเพณีต่างๆ

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ส่วนที่ 3. รูปแบบการรับประทานอาหาร

แบบสัมภาษณ์ ความถี่การรับประทาน อาหาร ประเภทไขมันสูง อาหารพืชผักที่มีเส้นใย และอาหารเค็ม

3.1. โดยปกติ ท่านรับประทานอาหารต่อไปนี้บ่อยเพียงใด ในช่วง รอบ 1 เดือนที่ผ่านมา โดยประมาณ (โปรด ทำเครื่องหมาย √ ลงในช่องว่าง ในช่องอาหารแต่ละประเภท)

ชนิดอาหาร	ไม่เคยบริโภค 0 มื้อ	เดือนละ 1-3 มื้อ	สัปดาห์ละ (มื้อ)						
			1-3	4-6	7-9	10-12	13-15	16-18	19-21
1.เนื้อสัตว์ ติดมันหรือหนัง									
- หมู									
- เนื้อไก่ / เป็ด									
- เนื้อโค/กระบือ									
- ปลาที่มีไขมันสูง เช่น ปลาสวาย									
2.ผลิตภัณฑ์เนื้อสัตว์									
- ไส้กรอก /ไส้อั่ว									
- หมูยอ									
- กุนเชียง									
- แหนม									
3. เครื่องในสัตว์ ตับ, ไต, สมอง									
4. ไข่ไก่หรือเป็ด									
5. อาหารมีกะทิ(แกงกะทิ,น้ำยา,)									
1. ผักสีเขียว ต่าง ๆ(ผักกาด,ตำลึง, ผักบุ้งและผักอื่นๆ)									
2. ผลไม้ ต่าง ๆ เช่น มะม่วง,ลำไย,ส้ม, มะละกอ,แตงโม,ฝรั่ง,พุทรา..									
3.ธัญพืช ข้าวกล้อง ข้าวซ้อมมือ ถั่ว									
1.อาหารหมักรสเค็ม (เนื้อเค็ม)									
2. อาหารรสเค็ม(ปลาเค็ม,ปลาทูเค็ม)									
3. ต้มยำ / ยำ									
4. อาหารผัก/ผลไม้ หมักหรือดองเค็ม									

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3.2 ในอาหารปรุงสำเร็จ เช่น ก๋วยเตี๋ยว หรืออาหารอื่นๆ ก่อนรับประทาน ท่าน ปรุงรสนำที่ท่านชอบ อย่างไร 1.( )ไม่ปรุง หรือ ชอบรสจืด (5) 2.( ) ปรุงรสใหม่ โดย มีรสนำคือ

2.1.( ) เผ็ด 2.2 ( ) เปรี้ยว 2.3.( ) เค็ม 2.4.( )หวาน

ส่วนที่ 4. แบบวัดบุคลิกภาพ (Type A Behavior)

ข้อความต่อไปนี้ เป็นลักษณะบุคลิกนิสัย / พฤติกรรมของแต่ละบุคคล กรุณาเลือกว่าข้อความใดในแต่ละข้อบรรยายลักษณะ ของท่านได้ดีที่สุด โดย ทำเครื่องหมาย √ ลงในช่องว่างในช่อง ( )

ข้อความข้างล่างนี้ แสดงถึงลักษณะของท่าน	ใช่	เป็นบางครั้ง	ไม่ใช่
4.1. มีความมุ่งมั่น เอาจริง เอาจัง	( )	( )	( )
4.2. มักจะเร่งรีบ ทำงานแข่งเวลาอยู่บ่อยๆ มีงานทำอยู่เสมอ ไม่ปล่อยให้เวลาว่าง	( )	( )	( )
4.3. ชอบการเป็นเจ้านาย ,ชอบออกคำสั่ง หรือเป็นผู้นำ	( )	( )	( )
4.4.ไม่ว่าเรื่องใดก็ตาม มักจะต้องการทำให้ดีเด่นที่สุด	( )	( )	( )
4.5. รับประทานอาหารเร็วมาก	( )	( )	( )
4.6. รู้สึกหงุดหงิดเมื่อต้องรอคอย	( )	( )	( )

สำหรับผู้ที่ทำงานนอกบ้าน ท่านมีความรู้สึกอย่างไรกับงานประจำของท่าน

4.7. บ่อยครั้งที่รู้สึกว่าต้องทำงานแข่งกับเวลา ( ) ใช่ ( ) ไม่ใช่

4.8. มักจะคิดถึงงานของท่านนอกเวลาบ่อยๆ ( ) ใช่ ( ) ไม่ใช่

4.9. บ่อยครั้งที่ต้องทุ่มเทความสามารถอย่างมากในการทำงาน( ) ใช่ ( ) ไม่ใช่

4.10.บ่อยครั้งที่รู้สึกไม่ค่อยแน่ใจ หรือไม่พอใจกับงานที่ทำอยู่( ) ใช่ ( ) ไม่ใช่

สำหรับผู้ที่เป็นพ่อบ้าน/แม่บ้าน ซึ่งไม่ได้ทำงานนอกบ้าน ท่านมีความรู้สึกอย่างไรกับงานบ้าน

4.7. รู้สึกว่าต้องทำงานแข่งกับเวลา ( ) ใช่ ( ) ไม่ใช่

4.8.รู้สึกว่าไม่พอใจอยู่บ่อยๆ ( ) ใช่ ( ) ไม่ใช่

4.9.มักจะคิดถึงงานอยู่ตลอดเวลา ( ) ใช่ ( ) ไม่ใช่

4.10.รู้สึกว่างานบ้านเป็นงานที่ทำให้เครียดมาก ( ) ใช่ ( ) ไม่ใช่

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(สำหรับนักวิจัยเก็บข้อมูลเอง)

ส่วนที่ 5. ข้อมูลประวัติทางด้านการแพทย์ (คัดลอกจากเวชระเบียน)

5.1 วัน เดือน ปี ที่ได้รับวินิจฉัยโรค……/……/……

5.2 การวินิจฉัยโรค……..

5.3 น้ำหนักตัวในขณะที่ได้รับการวินิจฉัยโรค……กิโลกรัม

5.4 ส่วนสูง ……เซนติเมตร

5.5 ความดันโลหิต Systolic ……mmHg

Diastolic ……mmHg

5.6 ข้อมูลทางการแพทย์อื่น

Total cholesterol (TC)…….mg./100 ml

HDL – C …… mg./100 ml

LDL – C …… mg./100 ml

Triglyceride (TG) …… mg./100 ml

Fasting blood sugar (FBS)……mg./100 ml

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APPENDIX C
CUT OFF POINT

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CUT OFF POINT

Variable	X	SD	Low	Medium	High
Fat-rich-diet	9.61	5.48	0 - 4.13	4.14 – 15.08	15.09 – 42
Total fiber diet	9.69	3.61	0 - 6.08	6.09 – 13.29	13.30 – 21
Salty diet	4.08	2.88	0 - 1.20	1.21 – 6.95	6.96 - 15

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