HYPERTENSION AND RISK FACTORS RELATED TO LIFESTYLE AMONG WOMEN AGED 40 YEARS AND OVER IN PHUTHAMONTTHON DISTRICT, NAKHON PATHOM PROVINCE, THAILAND

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ABSTRACT

A community-based case control study was conducted to determine the association between hypertension and factors related to lifestyle in Phuttamonthon District, Nakhon Pathom Province, Thailand. The randomly selected sample comprised 115 females aged 40 years and over who were diagnosed as hypertensive (BP≥140/90 mmHg). The controls were the randomly selected 109 females in the same age range with normal blood pressure (BP<140/90 mmHg). Data collection was carried out during January 15 and February 14, 2004. A structured questionnaire was used to collect information that was required for the objective determination in this study.

The results of the study indicated that the most significant risk factor of hypertension in the study was obesity (OR = 2.05, 95% CI = 1.62-3.63). It was confirmed that diabetes was also a risk factor of hypertension (OR = 2.42, 95% CI = 1.08-5.43). When obesity and diabetes were combined, the risk to develop hypertension was elevated (OR = 4.10, 95% CI = 1.17-15.72). It was also found that eating habits (additional salty seasoning use) was significantly associated with hypertension (p = 0.038). There was no significant association between hypertension and high cholesterol, salty food consumption, pattern of physical activity, stress management, knowledge and perception (p = 0.158, 0.502, 0.243, 0.50, 0.392 and 0.740, respectively).

According to the results of this study, several measures can be identified to minimize the risk of hypertension. Intervention programs should focus on controlling body weight. Furthermore, behavioral modification of eating habits relating to sodium use should focus on reducing the use of additional salty seasoning.

KEY WORDS : HYPERTENSION/ LIFESTYLE/ SODIUM/ PHYSICAL ACTIVITY/ STRESS/ OBESITY

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LIST OF ABBREVIATIONS

BRFSS	:	Behavioral Risk Factor Surveillance
BMI	:	Body Mass Index
CVD	:	Cardiovascular Disease
DBP	:	Diastolic Blood Pressure
DM	:	Diabetes Mellitus
IHS	:	International Hypertension Society
HDL	:	High Density Lipoprotein
LDL	:	Low Density Lipoprotein
MOPH	:	Ministry of Public Health (Thailand)
NCD	:	Non-Communicable Disease
SBP	:	Systolic Blood Pressure
WHO	:	World Health Organization

CHAPTER I
INTRODUCTION

1.1 Rational and justification

The prevalence of hypertension varies greatly within and between countries (1)(2) (Table 1). According to the WHO and the International Society of Hypertension (ISH), some 600 million people worldwide have high blood pressure and nearly 3 million die every year as a direct result. Hypertension is known as a major risk factor for cardiovascular diseases (CVD) (3), which are leading the main causes of death in developed countries (4). The epidemiological transition has been observed in developing countries in the past decades (5). The prevalence of hypertension is increasing, and CVD is rapidly becoming an important factor in developing countries and in the newly independent states of the former socialist republics (Table 2). Death and disability from coronary heart disease and cerebrovascular disease are also increasing so quickly with the rise of hypertension prevalence in those parts of the world (6).

Industrialization, urbanization, and international migration are processes with short- and long-term effects on the environment, as well as repercussions on the morbidity and mortality profiles. Declining mortality levels were correlated with a shift in the causes of disease and death: from infectious disease, malnutritional and poor reproductive health to rising chronic and degenerative disease. Toward the early 1970's, sedentarism, diets in rich animal fat, smoking and alcohol abuse led to the emergence of non-communicable diseases. CVD was increasingly presented as a product of lifestyle changes. Based on current estimates, by the year 2020, CVD will be the primary cause of death worldwide, as the living standards of the developing nations rise and their populations adopt the "Western lifestyle" (7).

In Thailand, Non-Communicable Disease (NCD) related morbidity has been rising (8). Among NCDs, the major contributor to morbidity is diabetes mellitus, followed by road traffic accidents, chronic respiratory disease and cardiovascular disease (Table 3). The mortality rate of CVD has been remarkably increased in past

decades (Figure 1). According to a 1998 report, 54,207 deaths were caused by CVD (Table 4). Likewise, the prevalence of hypertension has increased. In 1996, 1998, 2000 and 2001, the rates were 15.6, 10.3, 18.9, and 24.5 per 100,000 population (9). The Ministry of Public Health launched the 8th Health Development Plan in 1997. The plan has specific targets for reduction of health problems in Thailand. Reduction of mortality rate due to cardiovascular is one of the targets to be attained.

Hypertension is a multifactorial disease, developed by a combination of genetic, environmental and lifestyle factors (10). Among the lifestyle risk factors of hypertension, previous studies have listed obesity, excessive salt intake, deficiency in minerals such as potassium, magnesium and calcium, alcohol intake, smoking, physical inactivity and psychosocial stress. The WHO-ISH guideline in 1999 (7) mentioned that lifestyle measures reduces the risk of cardiovascular disease. This seems likely given all the other evidence suggesting that the benefits of antihypertensive treatment are determined primarily by the blood pressure reduction rather than by any other independent effect of particular treatment modalities.

It is clear that one of the biggest challenges facing public health authorities and medical practitioners is the control of hypertension worldwide, both in individual patients and at the population level (7). To meet this challenge, epidemiological and clinical researche should be conducted by recognizing the risk factors and how closely they are related to blood pressure level (11).

Table 1 Deaths by cause, sex and mortality strum in all WHO Regions, estimates for 2001

Cause	Both sex		Males		Females	
Populaton	6,122,210		3,083,884		3,038,327	
	(000)	%total	(000)	%total	(000)	%total
Total Death	56,554	100	29,62	100	26,926	100
Communicable Disease	18,374	32.5	9,52	32.2	8,846	32.9
Infectious and pararastic disease	10,937	19.3	5,87	19.8	5,062	18.8
Tuberculosis	1,644	2.9	1,07	3.6	569	2.1
HIV/AIDS	2,866	5.1	1,52	5.2	1,338	5.0
Malaria	1,124	2.0	53	1.8	592	2.2
Non-communicable Disease	33,077	58.5	16,72	56.5	16,352	60.7
Cardiovascular Disease	16,585	29.3	7,96	26.9	8,623	32.0
Hypertensive heart disease	874	1.5	39	1.3	477	1.8
Ischaemic Heart Disease	7,181	12.7	3,75	12.7	3,425	12.7
Cerebrovascular Disease	5,454	9.6	2,49	8.4	2,956	11.0
Diabetes Melitus	895	1.6	40	1.4	495	1.8
Malignant Neoplasms	7,115	12.6	3,95	13.3	3,163	11.7
Lung cancer	1,213	2.1	88	3.0	331	1.2
Stomach cancer	850	1.5	52	1.8	328	1.2
Liver cancer	616	1.1	42	1.4	193	0.7

Source: WHO World Health Report 2002

Table 2 Selected population attributable fractions by risk factor, sex and level of development (% DALYs for causes), 2000

Disease	World		High mortality Developing		Low mortality developing		Developed	
	M	F	M	F	M	F	M	F
Blood Pressure								
Cerevobascular Disease	61	62	56	56	57	60	72	72
Ischaemic Heart Disease	50	47	45	41	45	46	59	55
Other Cardiovascular Disease	14	13	11	10	12	12	20	18
Over Weight								
Hypertensive Disease	36	41	22	30	35	40	57	59

Note: High mortality developing; AFR-D, AFR-E, AMR-D, EMR-D, SEAR-D
Low mortality developing: AMR-B, EMR-B, SEAR-B, WPR-B
Developed: AMR-A, EUR-A, AUR-B, AUR-C, WPR-A
Source: WHO World Health Report 2002

Table 3 Reported NCD morbidity profile, 1998

Disease	Number of cases	Comments
All cancers	34,759	The data is based on
Cardiovascular disease	151,637	hospital-based information only
Ischaemic heart disease	33,269	except for diabetes which is
Rheumatic heart disease	11,412	based on survey. The cancer data,
Stroke	43,446	though hospital-based seems to
Other heart disease	63,510	be similar to the cancer residtry
Diabetes mellitus	1,380,000	data
Injuries	NR	
Road traffic accidents	200,419	
Other injuries	NR	
Poisoning	33,305	
Suicides	8,298	
Chronic respiratory disease	167,832	
Neuro-psychiatric disorders	60,106	

NR – Not reported.
Sources: http://w3.whosea.org/cntryhealth/pdf/thai-morbidity.pdf
Bureau of Health Policy and Planning, Thailand Health Profile 1997 – 1998, Ministry of Public Health, Thailand.

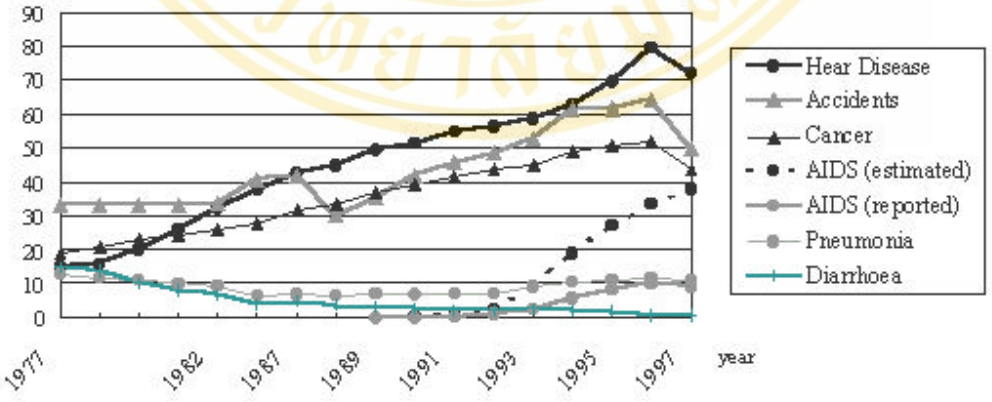


Figure 1: Mortality rates due to major causes among Thai people, 1977-1997
Source: Ministry of Public Health, Thailand Health Profile 1997-1998

Table 4 Reported NCD mortality profile, 1998

Disease	Number of deaths (% of all deaths)		Comments
All cancers	30,121	(9.5)	The source is the Death
Cardiovascular disease	54,207	(17.1)	Registration System.
Ischaemic heart disease	2,266		The system of
Rheumatic heart disease	274		classification is by
Stroke	4,427		systems (like diseases
Other heart disease	37,457		of circulatory system).
Diabetes mellitus	4,885	(1.5)	Therefore, there may be
Injuries	31,202	(9.8)	differences in case
Road traffic accidents	8,165		definition as compared
Other injuries	NR		to other countries.
Poisoning	179		
Suicides	5,096		
Homecides	3,734		
Chronic respiratory disease	2,627	(0.8)	
Neuro-psychiatric disorders	10,068	(3.2)	
Total	153,365	(41.9)	

NR – Not reported.
Sources: http://w3.whosea.org/cntryhealth/pdf/thai-mortality1.pdf
Bureau of Health Policy and Planning, Thailand Health Profile 1997 – 1998, Ministry of Public Health, Thailand.

1.2 Research question

What are the factors related to hypertension and life style among women aged 40 years and over in Phutthamonthon District, Nakhon Pathom Province, Thailand.

1.3 Research objective

1.3.1 General objective

To determine the association between hypertension and factors related to life style among women aged 40 years and over in Phutthamonthon District, Nakhon Pathom Province, Thailand.

1.3.2 Specific objectives

1.3.2.1 To describe socio-demographic characteristics of the target population.

1.3.2.2 To identify the associations between hypertension and behavioral factors, such as: sodium consumption behavior, pattern of physical activity, and stress management; among the target population.

1.3.2.3 To identify the associations between hypertension and physical factors, such as: nutritional and health status; among the target population.

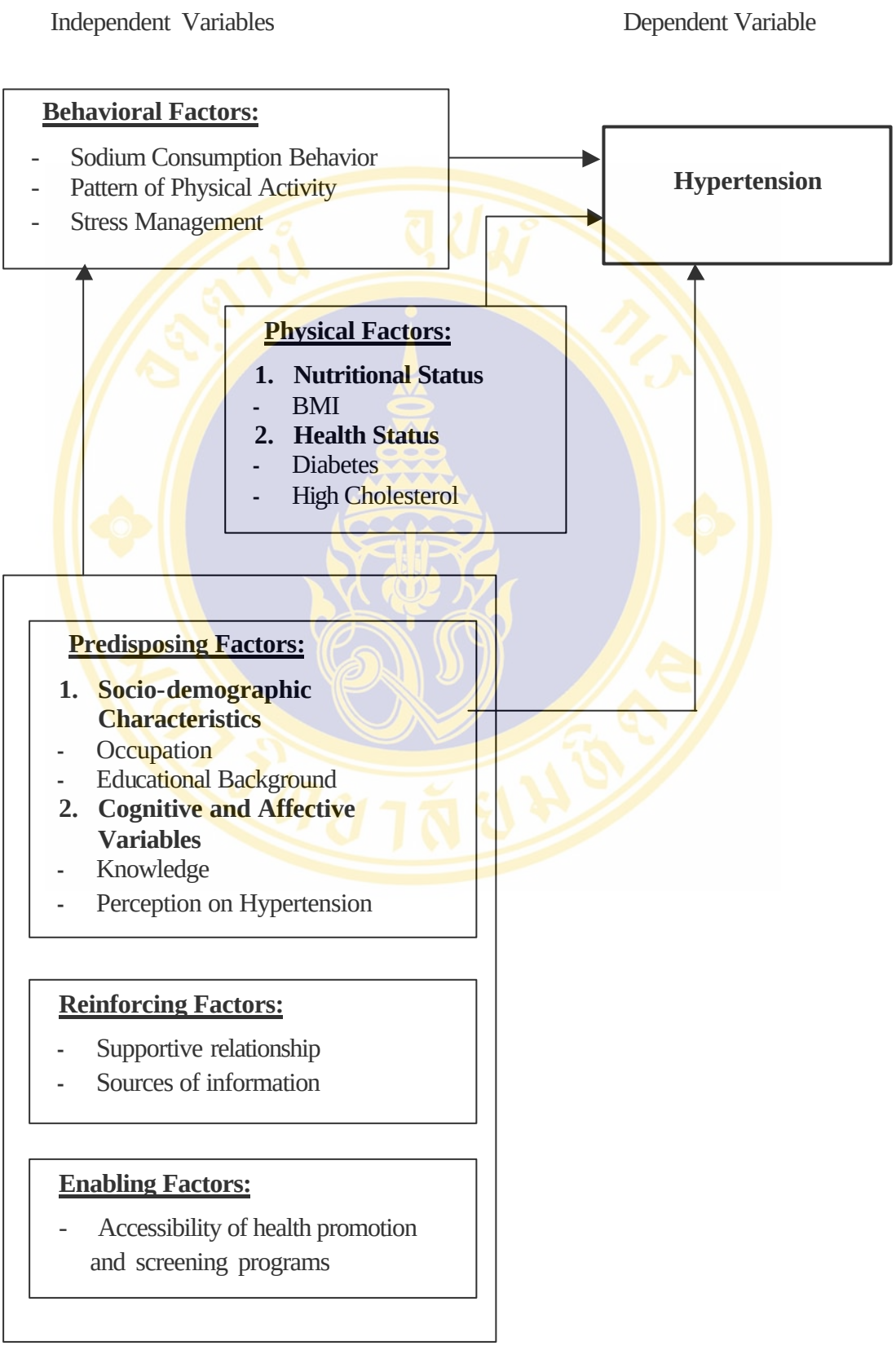
1.3.2.4 To identify the associations between hypertension and predisposing factors, such as: socio-demographic characteristics and cognitive and affective variables; among the target population.

1.3.2.5 To describe the association between hypertension and reinforcing and enabling factors, such as: supportive relationship, sources of health information, and accessibility of health promotion and screening programs; among the target population.

1.3.2.6 To examine the associations between the behavioral factors, such as: sodium consumption behavior, pattern of physical activity, and stress management; and the predisposing factors, such as: cognitive and affective variables; among the target population.

1.3.2.7 To examine the inter-association of the physical factors, such as: the associations between nutritional and health status; and association between physical factors and predisposing factors, such as: health status and cognitive and affective variables; among the target population.

1.4 Conceptual framework



1.5 Research hypothesis

1.5.1 There are associations between hypertension and behavioral factors, such as: sodium consumption behavior, pattern of physical activity and stress management; among the target population.

1.5.2 There are association between hypertension and physical factors, such as: nutritional and health status; among the target population.

1.5.3 There are associations between hypertension and predisposing factors, such as: socio-demographic characteristics and cognitive and affective variables; among the target population.

1.5.4 There are associations between behavioral factors, such as: sodium consumption behavior, pattern of physical activity and stress management; and predisposing factors, such as: cognitive and affective variables among the target population.

1.5.5 There are inter-association of the physical factors, such as: the associations between nutritional and health status; and association between physical factors and predisposing factors, such as: health status and cognitive and affective variables; among the target population

1.6 Operational definition

1.6.1 Dependent variable

1.6.1.1 Blood pressure

According to the 1999 WHO-ISH hypertension guidelines (Table 5), the normal blood pressure in this study is set <140/90 mmHg (7).

Table 5 1999 WHO/ISH definitions and classification of BP levels

Category	Systolic BP (mm Hg)	Diastolic BP (mm Hg)
Optimal BP <120 <80	<120	<80
Normal BP	<130	<85
High-Normal BP	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
Grade 3 Hypertension (severe)	≥180	≥110
Isolated Systolic Hypertension	≥140	<90
Subgroup: Borderline	140-149	<90

.Source: WHO-ISH Guidelines for the Management of Hypertension, 1999

1.6.2 Independent variables

1.6.2.1 Lifestyle

Stress, diet, obesity, physical inactivity, alcohol intake and smoking are regarded as risk factors related to lifestyle (10). Since only women were the subjects in this study and the prevalence of excessive alcohol intake and smoking among Thai women is quite low (Proportion of smoker in age group 10 years and over, 1999: male 38.8%, female 2.4%. Alcohol consumption among working-age population, 1997: male 54.8%, female 19.4%) (12), this study specialized diet, obesity and physical inactivity as risk factors related to lifestyle.

1.6.2.2 Sodium consumption behavior (eating habits relating to sodium use)

Salty food consumption and eating habits on additional salty seasoning use were explored as the sodium consumption behavior of the study subject. Salty food was regarded as risk food to elevate blood pressure in this assessment. Dietary assessment methods of Behavioral Risk Factor Surveillance System (BRFSS) developed by the National Center Institute for Chronic Disease Prevention and Health Promotion, U.S. was applied to the risk food consumption

assessment in this study. A frequency of 10 typical high sodium foods (Ref. attached questionnaire in Appendix A) in Thailand was asked. The questionnaire for the eating habits in this study was designed based on the Kristal's Eating Pattern Questionnaire developed by the Fred Hutchinson Cancer Research Center (13). Eating habits assessment in this study focused on additional salty seasoning use when food is served. Additional salty seasoning use with noodles was also used as an indicator for sodium consumption behavior. The criteria to access the eating habits in this study were as follows:

1. Frequency of eating noodles
2. Amount of additional salty seasoning use (such as fish-sauce) with noodles
3. Whether finishing all of the noodle soup or not

1.6.2.3 Pattern of physical activity

Type of physical activities and approximate frequency, and time duration per day were the information to calculate the burnt calories. Each amount of calories was regarded as the amount of energy consumption in respective activities.

1.6.2.4 Stress management

Magnitude of stress was measured with the Thailand standard questionnaire on stress assessment developed by the MOPH. The questionnaire was composed to measure physical, emotional and behavioral symptoms of stress. The result score of the assessment was the sum of three particulars' sub-totals. According to the result analysis guideline of the questionnaire, the subjects were classified into high stress or normal group.

Methods of stress management were asked by multiple choice. Items of multiple choice were as follows:

1. Sports
2. Chatting with friends
3. Shopping

4. Eating
5. Thai-massage
6. Listening to music
7. Something related to religion
8. Taking an afternoon nap
9. Other
10. Nothing special

1.6.2.5 Occupation

Respondents' and their spouse's occupation were asked by multiple choice. Items of multiple choice were as follows:

1. Farmer
2. Civil Servant
3. Owner of small business
4. Employee in private company
5. No occupation / Housewife (for women)
6. Other

1.6.2.6 Educational background

Educational background of the respondents was asked and classified by educational year as follows:

1. No schooling
2. Primary level: 1-6 schooling years
3. Secondary level: 7-12 years
4. Highest level: more than 12 years

1.6.2.7 Nutritional status (BMI)

Body Mass Index (BMI) is defined as weight (in kg) divided by the square of one's height (in m): kg/m2. . The cut-off point to divide the subjects into normal and overweight groups in this study was BMI 25, adopted to the classification index for adult Asians by the International Diabetes Institute (Table 6).

1.6.2.8 Health status (Diabetes)

Whether the respondents have been diagnosed as having diabetes or not was asked. Options of the answers were "Yes", "No" and "Don't know".

Table 6 Proposed classification of weight by BMI in adult Asians

Classification	BMI (kg/m2)
Underweight	<18.5
Normal Range	18.5-22.9
Overweight:	≥23
At Risk	23-24.9
Obesity I	25-29.9
Obesity II	≥30

Source: The Asia-Pacific perspective: Redefining obesity and its treatment, International Diabetes Institute, WHO Collaborating Center for the Epidemiology of Diabetes Mellitus and Health Promotion for Non-communicable Disease, 2000

1.6.2.9 Health status (High cholesterol)

Whether the respondents have been diagnosed as having hypercholesterolemia or not was asked. Options of the answer were the same as the previous question on diabetes.

1.6.2.10 Knowledge on hypertension

It refers to the subjects' knowing and understanding about risk factors and preventive factors of hypertension: such as associations with sodium consumption, physical activity, stress, nutritional status, genetic factor and consequent complications. Knowledge assessment was composed of eight yes/no type questions, and transformed into score for knowledge. To avoid correct answers by chance as much as possible, "Not sure" was included in the answer options.

1.6.2.11 Perception on hypertension

It refers to the perception on susceptibility, severity, and fearfulness of hypertension. Optimistic or pessimistic feelings to take preventive

behavior of hypertension were also included with the perception. The answers were given in a rating scale, and transformed into score for perception.

1.6.2.12 Supportive relationship

It refers to influential persons on preventive behavior of hypertension and any health related topic. The answer was a checklist as follows:

1. Family
2. Friends
3. Health staff
4. No one
5. Other

1.6.2.13 Sources of information

It refers to sources of information related to health. The question was asked in multiple choice as follows:

1. Books, magazines or newspapers
2. Brochures or pamphlets from hospital or health center
3. Health promotion programs conducted by health center
4. TV or radio programs
5. Family members or friends
6. School education
7. No information
8. Other

1.6.2.14 Accessibility of health promotion and health screening programs

Whether respondent joined previous health promotion activities or not, whether respondent utilized the health screening service or not in the past one year, were asked.

1.7 Usefulness, scope and limitation of the study

1.7.1 Usefulness of the study

This study was expected to determine the association between hypertension and factors related to life style among women aged 40 years and over in Phutthamonthon District, Nakhon Pathom Province, Thailand. The determination can be used as baseline data for future hypertension prevention programs in the study area.

1.7.2 Scope and limitation of the study

This study was carried out in one of districts in Nakhon Pathom Province. The findings of this study may not be generalized to other districts in and out of Nakhon Pathom Province in Thailand.

Due to the limitation of the study duration and language barrier, the amount and quality of data was affected.

CHAPTER II
LITERATURE REVIEW

This chapter consists of the following parts:

2.1 Review about theory of the study
- 2.1.1 Framework of the PRECEDE model
- 2.1.2 Application of the PRECEDE model for this study

2.2 Review about dependent variable: Overview and Findings
Hypertension

2.3 Review about independent variables: Overview and Findings
- 2.3.1 Age
- 2.3.2 Gender
- 2.3.3 Occupation
- 2.3.4 Educational background
- 2.3.5 Nutritional status
- 2.3.6 Diabetes
- 2.3.7 High cholesterol
- 2.3.8 Health education
- 2.3.8 Sodium
- 2.3.10 Physical activity
- 2.3.11 Stress

2.4 Summary

2.1 Review about theory of the study

2.1.1 Framework of the theory

The PRECEDE Model

The PRECEDE model is a framework for the process of systematic development and evaluation of health education programs, originated late 1960's by Lawrence W. Green. PROCEED was added to the model approximately 20 years after the PRECEDE, based on L. Green's experience with Marshall Krueter, originally as a model for health education and promotion planning (Figure 2)(14). PRECEDE stands for Predisposing, Reinforcing and Enabling factors in Education Diagnosis and Evaluation, and the model consists of 5 phases of assessment as follows: 1)Social, 2)Epidemiological, 3)Behavioral and environmental, 4)Educational and ecological, and 5)Administrative and policy.

Phase 1 - Social Diagnosis

The focus of this phase is to identify and evaluate the social problems which impact the quality of life of a target population. The social problems affect the quality of life of the patient, consumer, student, or community, as those populations see those problems. This followed by the establishment of a link between these problems and specific health problems.

Phase 2 - Epidemiological Diagnosis

Phase 2 helps determine health issues associated with the quality of life. It helps identify behavioral and environmental factors related to the quality of life issues. The focus of this phase is to identify specific health problem and non health factors which are associated with a poor quality of life.

Phase 3 - Behavioral & Environmental Diagnosis

This phase focuses on the systematic identification of health practices and other factors which seem to be linked to health problems defined in Phase 2. This includes non-behavioral causes that can contribute to health problems,

but are not controlled by behavior. Assessed are the behaviors which cause health problems in the target population. Behavioral diagnosis is completed for each health problem identified on Phase 2.

Phase 4 - Educational and Ecological Diagnosis

This phase assesses the causes of health behaviors which were identified in Phase 3. Three kinds of causes are identified - predisposing factors, enabling factors, and reinforcing factors. The critical element of this phase is the selection of the factors which if modified, will be most likely to result in behavior change.

Phase 5 - Administrative & Policy Diagnosis

Phase 5 focuses on the administrative and organizational concerns which must be addressed prior to program implementation. This diagnosis is aimed with pertinent and systematically organized assessment information.

Most health problems have some combination of behavioral, environmental, and genetic or biological factors. Behavioral assessment at phase 3 in the PRECEDE model is a systematic analysis of the behavioral links to health problems identified in the prior assessment, epidemiological and social assessments. The environment assessment is a parallel analysis of factors in the immediate social and physical environment, other than specific actions, that could be casually linked to the behavior identified in the behavioral assessment or directly to the outcomes of interest (health or quality of life).

Risk factor is the more formal and precise term for a factor that increases the probability of developing a disease or health problem. Some population health circles object to this term because risk factors are measured at the individual level. On the other hand, the determinations of health are more distal in time, place, or scope from the control of individuals than are the more proximal and malleable risk factors such as current behavior. By this definition, epidemiologists would see risk conditions as a subclass of risk factors.

2.1.2 Application of the PRECEDE model for this study

This case control study was to determine the association between hypertension and factors related to life style. Respective studied variables were classified according to the PRECEDE model (Figure 3).

The Ministry of Public Health in Thailand launched a new health development program on non-communicable disease control in 1991. District hospitals and regional health centers have been providing several kinds of health promotion and screening programs. In this administrative condition, risk factors related to one of the prioritized health problems, hypertension, were examined by the application of the PRECEDE assessment method. The studied variables were set up as follows:

2.1.2.1 Epidemiological Diagnosis

The focus of this phase should be to identify specific health problem. Hypertension was determined as the health problem in this study and its risk factors were diagnosed in the following phases.

Physical Factors:

One specific health problem often has associations with other health problems. Health problems, obesity, diabetes and high cholesterol were predicted as the risk factors to elevate blood pressure in this study. Nutritional status (BMI) and health status (diabetes and high cholesterol) were examined as physical factors of hypertension.

2.1.2.2 Behavioral Diagnosis

Behavioral Factors:

Individuals' behavioral patterns related to hypertension, such as: sodium consumption behavior, pattern of physical activity and stress management; were predicted factors that directly affect blood pressure status.

Although environmental diagnosis should be carried out in the same phase as behavioral diagnosis, this study only focused on behavioral factors due to time limitation.

2.1.2.3 Educational and Ecological Diagnosis

Predisposing Factors:

It included socio-demographic variables such as: occupation (both respondents' and their husbands') and educational background. Knowledge and perception on hypertension were the cognitive and affective variables in this stage.

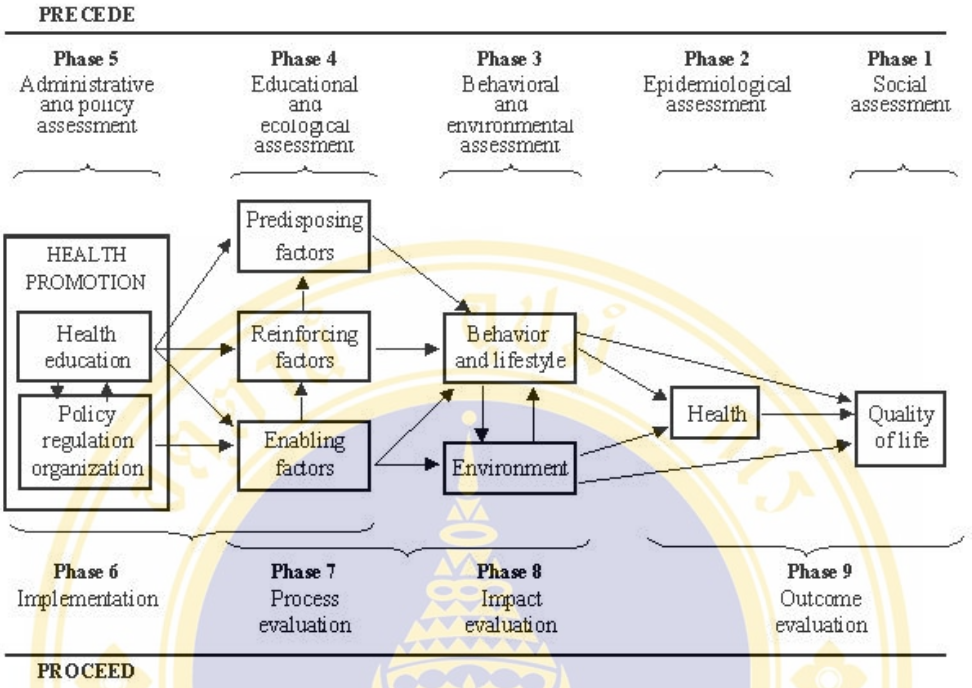
Enabling factors:

Influential persons related to the behavioral factors, such as: taking care of diet, practicing exercise regularly, and practicing meditation; were regarded as enabling factors. The sources of health information were also examined as an enabling factor.

Reinforcing factor:

Accessibility of health promotion and screening programs that were previously provided by the district hospital and health centers is regarded as the reinforcing factor.

By this application, risk factor assessment is conducted in this study.



Source: Lawrence W. Green, Health Promotion Planning, 1999

Figure 2: PRECED-PROCEED Model

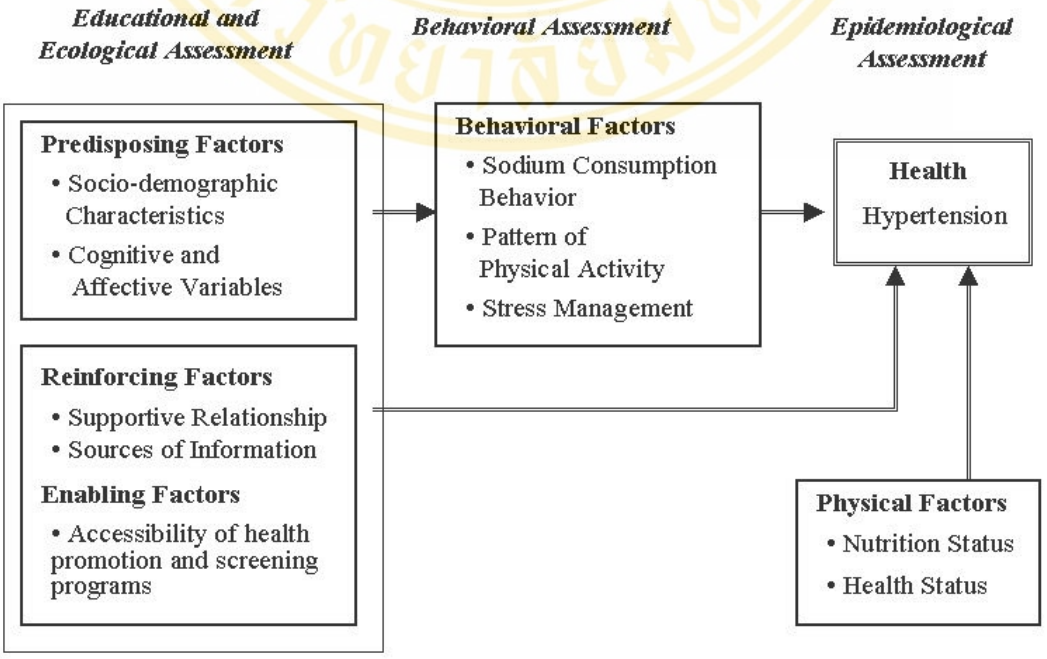


Figure 3: Application of the PRECEDE models for this study

2.2 Review about dependent variable

2.2.1 Hypertension

WHO has been concerned with hypertension since the 1950s. The Expert Committee on Cardiovascular Disease and Hypertension, convened in October 1958 in Genova, gave special consideration to the classification and criteria for the diagnosis of hypertension (15). A subsequent Expert Committee met in Genova in October 1961. It described the stages of hypertension but its recommendations were limited to therapeutic remedies directed against the progressive effect of disease (secondary prevention) (16). A third Expert Committee met in Genova in March 1978 and dealt with the epidemiology, prevention and control of hypertension (17).

Historically more emphasis has been placed on diastolic than systolic blood pressure as a predictor of cerebrovascular and coronary heart disease. This was reflected in the design of the major randomized controlled trials of hypertension management which, almost universally, used diastolic blood pressure thresholds as inclusion criteria until the 1990s (18). Subjects with isolated systolic hypertension were excluded by definition from such trials. Nevertheless, large compilations of observational data before (19) and since the 1990s (20) confirm that both systolic and diastolic blood pressures show a continuous graded independent relationship with risk of stroke and coronary events (21). In 1999, WHO and the International Society of Hypertension (ISH) defined hypertension 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 (7).

Hypertension is one of several risk factors for cardiovascular disease. When the level of blood pressure is only slightly above the threshold for definition of hypertension, the presence of one of more of these factors may be a more important determination of the patient's risk, especially of a coronary event, the increase in blood pressure. Since the absolute benefits of treatment for hypertension will be determined by the absolute risk of cardiovascular disease (i.e. greater benefits for those at higher risk), each of these factors should be assessed before deciding on treatment (22).

2.3 Review about independent variables

2.3.1 Age

Overview

Changes in body structure and function occur with age. Age-related rise of blood pressure is neither an inevitable nor normal biological accompaniment of the age process (23). Blood pressure rises with age for most people during the decades from youth through middle age. As a consequence, by middle age, population average systolic (SBP) and diastolic (DBP) blood pressure are above optimal levels (below 120/80 mmHg)(24).

Aging is not only a risk factor to develop hypertension but also a risk factor to cause many diseases. However, aging itself is no a disease. Efforts of psychological factors, exercise and diet can contribute to healthy active life expectancy (23)

Findings of previous studies

Cross-sectional surveys, as well as prospective observational cohort studies, have consistently demonstrated a positive relation between age and blood pressure in most populations with diverse geographical, cultural and socio-economic characteristics (23).

In Thailand, higher prevalence of hypertension is found among higher aged population (Table 7). A cross-sectional study conducted in Bangkok, 2002, confirmed that age is one of considerable factors of hypertension. Among male subjects in the study, when comparing with age group less than 45 years, men age groups 45-60 and >60 years had significantly higher risk of having SBP>140 mmHg with OR = 3.96 (95%CI = 3.18-5.27) and OR = 9.59 (95%CI = 6.03-15.31), and DBP>90 mmHg with OR = 2.71 (95%CI = 2.71-3.39) and OR = 2.85 (95% CI = 1.71-4.72), respectively. Among female subjects, when comparing with age group less than 45 years, women age groups 45-60 and >60 years had higher risk of having SBP>140 mmHg with OR = 5.51 (95%CI = 3.90-7.78) and OR = 19.04 (95%CI = 9.53-38.05), and DBP>90 mmHg with OR = 2.82 (95%CI = 2.17-3.68) and OR = 3.68 (95% CI = 1.62-8.13), respectively (25) (Table 8).

A study on urbanization and health reported that increasing life expectancy is one of reasons of today's increasing hypertension prevalence (26). WHO announced that more than 1,000 million people aged 60 years and over will be living in the world by 2020, and launched in April 1995 a new program on aging and health.

Table 7 Raised Blood Pressure, 2000, Thailand

Sex	Age Groups	Prevalence (%)
Male	35 - 44	(14.9)
	45 - 54	(23.4)
	55 - 64	(30.3)
	≥65	(36.2)
Female	35 - 44	(09.7)
	45 - 54	(25.9)
	55 - 64	(35.5)
	≥65	(35.7)

Definition used: SBP 140/DBP 90 or on current antihypertensive medication
Survey Population: National, both urban and rural populations
Source: InterASIA Collaborative Group. Cardiovascular risk factors in urban and rural Thailand- the international collaborative study of cardiovascular diseas in Asia (InterASIA). Journal of Cardiovascular Risk. 2003. Additional data from personal communication: Bruce Neal and Ministry of Health. (in press).
Note: No sample size provided.

Table 8 Adjusted OR* (95%CI) of having SBP>140mmHg and DBP>90mmHg by gender

Age group	Male	Female
SBP>140mmHg		
<45	1	1
45-60	4.10 (3.18-5.27)	5.51 (3.90-7.78)**
>60	9.59 (6.01-15.31)	19.04 (9.53-38.05)**
DBP> 90mmHg		
<45	1	1
45-60	2.71 (2.17-3.39)**	2.82 (2.17-3.68)**
>60	2.85 (1.71-4.72)**	3.63 (1.62-8.13)**

* OR adjusted for BMI
** Significant OR
Source: Prevalence of hypertension and obesity among the working population in Bangkok, Thailand, Jpournal of Public Health, 2003

2.3.2 Gender

Overview

Early in life there is little evidence of a difference in blood pressure between the genders. Beginning at adolescence, however, men tend to display a higher average level. This difference is most evident in young and middle-aged adults. Late in life the difference narrows and the pattern may even be reversed (27). While this change late in life is partly accounted for by higher premature death rates of middle-aged men with high blood pressure, post-menopausal changes in women also may be contributory. Studies are in progress to evaluate whether estrogen supplementation protects against the late relative rise of blood pressure in women (22).

Findings of previous studies

As characteristics of study subjects of clinical researches related to hypertension, it has been found that female subjects are usually older than male subjects. A study to assess sex-based differences in presentation reported that the women were older than the men and had significantly higher rates of diabetes, hypertension, and prior congestive heart failure among 12,142 patients (3662 women and 8480 men) with acute coronary syndromes (28). Another study of gender differences in the treatment and outcome of acute myocardial infarction reported the characteristics of the study subjects that women were older and more often had histories previous hypertension and previous congestive heart failure among 4,891 consecutive patients, including 1659 women, were hospitalized for acute myocardial infarction in 19 hospitals in the Seattle (Wash) metropolitan area (29).

In Thailand, a survey conducted in 3,615 Shinawatra employees aged 18-60 years reported the prevalence of hypertension was more common in males and the prevalence increased sharply after the age of 25 years in males and 40 years in females (30).

2.3.3 Occupation

Overview

In countries, that are in the post-transitional stage of economic and epidemiological change, consistently higher levels of blood pressure and a higher

prevalence of hypertension have been noted in lower socio-economic groups. This inverse relation has been noted with levels of education, income and occupation. However, in societies that are transitional or pre-transitional, higher levels of blood pressure and a higher prevalence of hypertension have been noted in upper socio-economic groups. This probably represents the initial stage of the epidemic of cardiovascular disease. Experience in most societies has revealed a reversal of the social groups affected as the epidemic (22).

2.3.4 Educational background

Overview

Educational background is also a predictor to judge socio-economic status as well as occupation (7). Higher educational levels are usually regarded as higher socio-economic status.

Phutthamonthon District is located in the Central region in Thailand. According to the National Statistic in Thailand, proportion of the people who attained more than secondary education among unpaid home workers and subcontract workers is much smaller than that among contract workers. This tendency is also observed in Central region in Thailand (Table 9), and higher education usually tends to promise people to get job with higher income.

Table 9 Number of home workers aged 13 years and over by type of home workers, educational attainment, and sex, Central region in Thailand, 2001

Education level	Contract Workers		Unpaid Home Workers		Subcontract Workers		Total
	Male	Female	Male	Female	Male	Female	
No education	92	2,255	2	164	-	-	2,513
Primary level	12,445	42,668	1,694	9,108	326	274	65,194
Secondary level	2,225	4,980	879	1,199	215	152	9,650
University level	52	131	8	-	-	75	226
Vocational	83	54	39	32	23	-	231
Teacher training	4	35	-	-	-	-	39
Unkown	66	83	-	90	-	-	239
Total	14,697	50,206	2,622	9,272	564	501	78,132

Source: The National Statistical Office, Thailand

2.3.5 Nutritional status

Overview

Evidence for a direct, strong and consistent relationship between weight and blood pressure emerges from cross-sectional and prospective observational studies. I most studies, being overweight is associated with a two-fold to six-fold increase in the risk of developing hypertension (31). The population of hypertension attributable to obesity has been estimated to be 30-65% in Western populations. From observational data, multivariate regressions of blood pressure show a rise of 2-3mmHg (0.13-0.27 kPa) SBP and 1-3 mmHg (0.13-0.4 kPa) DBP for each 10 kg increase in weight (22).

Recent studies have shown that overweight and obesity affect over half the adult population in many countries. Obesity is common in industrialized countries and is rapidly increasing in many developing countries. The prevalence of obesity in adults is 10% to 25% in most countries of Western Europe and 20% to 25 % in some countries in the Americas (32).

From the report on the 3 rd and 4 th National Nutritional Surveys in 1986 and 1995,the prevalence of obesity among Thai people has increased in all age groups. The group aged 40-49 has the highest rising rate from 19.1 to 40.2 percent, followed by the group with ages of 20-29 that has the increasing rate of 2.9 to 20.4 percent (Figure 4). Besides in the population with ages over 20,obesity is found in children and youths at a rate of 9.3-13.6 percent. This implies that obesity is becoming a prime health problem required an urgent resolution.

Findings of previous studies

An impact of body weight on blood pressure study was conducted in the municipality of Tromso, northern Norway, in 1986 and 1987 and again in 1994 and 1995. Altogether, 75% of the individuals, women aged 20 to 56 years and men aged 20 to 61 years, attended the baseline examination. A total of 15,624 individuals (87% of all still living in the municipality) were examined twice. Adjusted for several covariates, BMI change was associated with systolic and diastolic blood pressure change for both sexes (regression coefficients: 1.43 [95% confidence interval (CI), 1.23-1.64] and 0.90 [95% CI, 0.76-1.04], respectively, for men; and 1.24 [95%

CI, 1.09-1.39] and 0.74 [95% CI, 0.63-0.84] for women) (Table 10). Baseline BMI was associated with systolic and diastolic blood pressure change for women only (regression coefficients: 0.38 [95% CI, 0.30-0.47] and 0.17 [95% CI, 0.11-0.23], respectively) (33).

A cross-sectional study on hypertension and obesity among working population in Bangkok was conducted during January to May 2002, of total 7,755 population. Among male subjects in the study, when comparing with the group of population with BMI<25, men with BMI 25-30 and >30 had significantly higher risk of having SBP>140 mmHg with OR = 2.39 (95%CI = 1.90-3.02) and OR = 7.30 (95%CI = 4.91-10.85), and DBP>90 mmHg with OR = 2.58 (95%CI = 2.07-3.21) and OR = 7.24 (95% CI = 4.97-10.56), respectively. Among female subjects, when comparing with the group of population with BMI<25, men with BMI 25-30 and >30 had significantly higher risk of having SBP>140 mmHg with OR = 3.42 (95%CI = 2.50-4.68) and OR = 11.43 (95%CI = 7.85-16.65), and DBP>90 mmHg with OR = 3.38 (95%CI = 2.56-4.47) and OR = 11.30 (95% CI = 8.07-15.81), respectively (25) (Table 11).

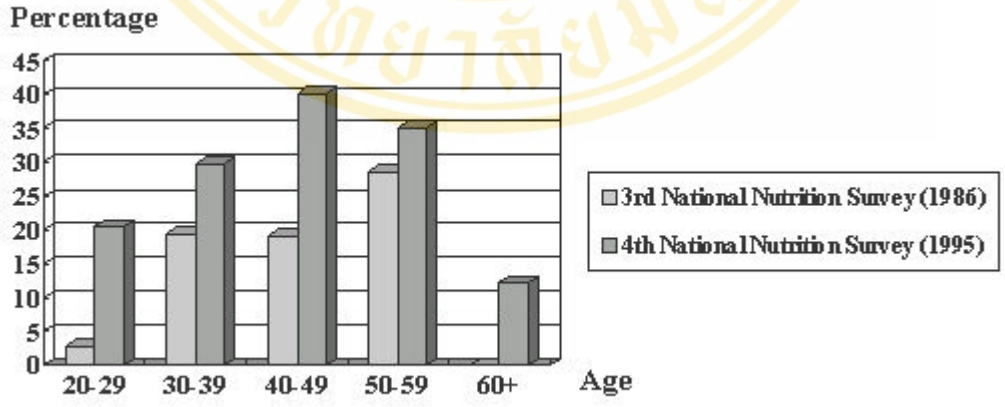


Figure 4: Prevalence Rate of Obesity in Thailand by Age,1986 and 1995

Source: Department of Public Health, Thailand

Table 10 Regression coefficient and its 95% CI of BMI change and BP by sex

	Regression coefficient (95% CI)	
Sex	**SBP**	**DBP**
Male	1.43 (1.23-1.64)	0.90 (0.76-1.04)
Female	1.24 (1.09-1.39)	0.74 (0.63-0.84)

Table 11 Adjusted OR# (95%CI) of having SBP>140mmHg and DBP>90mmHg by gender

BMI	Male		Female	
	SBP>140mmHg	**DBP>90mmHg**	**SBP>140mmHg**	**DBP>90mmHg**
<25	1	1	1	1
25-30	2.39 (1.90-3.02)*	2.58 (2.07-3.21)*	3.42 (2.50-4.68)*	3.38 82.56-4.47)*
>30	7.30 (4.91-10.85)*	7.24 (4.97-10.56)*	11.43 (7.85-16.65)*	11.30 (8.07-15.81)*

OR adjusted for age
*Significant OR
Source: Prevalence of hypertension and obesity among the working population in Bangkok, Thailand, Journal of Public Health, 2003

2.3.6 Diabetes

Overview

The prevalence of hypertension is 1.5 to 2 times greater in patients with diabetes mellitus compared with matched non-diabetic individuals (34). Type 1 diabetes mellitus is associated with hypertension only when albuminuria and early nephropathy develop, but Type 2 diabetes mellitus may be associated with hypertension at or even preceding diagnosis (35). In type 2 diabetes, over 70% of hypertensive patients (140/90 mmHg) was found (36, 37). Patients with both hypertension and diabetes are especially vulnerable to cardiovascular and renal complications. In patients with incipient diabetec nephropathy, treatment may be

instituted at SBP and DBP values as low as 130 mmHg (17.3kPa) and 85 mmHg (11.3kPa) respectively (22).

Lifestyle modifications are beneficial for control of hyperglycaemia, dyslipidaemia and hypertension, which often occur in obese patients with insulin resistance. The syndrome of insulin resistance, characterized by frequency central obesity (38), very closely parallels non-insulin-dependent diabetes mellitus. Insulin sensitivity can be improved by weight reduction and exercise (22).

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Findings of previous studies

To evaluate possible risk factors, a study was conducted to compare blood pressures and plasma glucose and insulin responses to orally administered glucose in 19 above-knee amputees from the Vietnam War (mean age, 36 +/- 1 years) with those of 12 age-matched unilateral below-elbow amputees. Body composition by densitometry and maximal oxygen consumption during arm or leg exercise were also determined. Nine of 19 leg amputees were hypertensive compared with one of 12 arm amputees. Their 3-hour average insulin responses were markedly increased (260 +/- 60 microU/ml) compared with those of normotensive leg (125 +/- 24 microU/ml) and arm amputees (101 +/- 20 microU/ml), and their mean body fat content (37.2%) also was elevated compared with that in both of these groups (23.2 and 22.6%, respectively). A unique finding was that both insulin response and body fat content were strongly and independently correlated with diastolic blood pressure (r = 0.55, p less than 0.01, and r = 0.62, p less than 0.01, respectively). We conclude that insulin may be a major factor in blood pressure regulation in the maturity-onset obesity that develops following traumatic leg amputation in young, healthy men (39).

Another study on hypertension and glucose intolerance among determined in a random population sample (n = 2,475), showed a highly significant (P less than 0.001) association from the mildest levels of both conditions, independent of the confounding effects of age, gender, obesity, and antihypertensive medications. Summary rate ratios for hypertension were 1.48 (1.18-1.87) in abnormal tolerance and 2.26 (1.69-2.84) in diabetes compared with normal tolerance. Altogether, 83.4% of the hypertensives were either glucose-intolerant or obese--both established insulin-resistant conditions. Fasting and post-load insulin levels in a representative

subgroup (n = 1,241) were significantly elevated in hypertension independent of obesity, glucose intolerance, age, and antihypertensive medications. The mean increment in summed 1- and 2-h insulin levels (milliunits per liter) compared with nonobese normotensives with normal tolerance was 12 for hypertension alone, 47 for obesity alone, 52 for abnormal tolerance alone, and 124 when all three conditions were present. The prevalence of concentrations (milliequivalents per liter) of erythrocyte Na+ greater than or equal to 7.0, K+ less than 92.5, and plasma K+ greater than or equal to 4.5 in a subsample of 59 individuals with all combinations of abnormal tolerance obesity and hypertension was compared with those in 30 individuals free of these conditions. Altogether, 88.1% of the former vs. 40.0% of the latter group presented at least one of these three markers of internal cation imbalance (P less than 0.001). We conclude that insulin resistance and/or hyperinsulinemia (a) are present in the majority of hypertensives, (b) constitute a common pathophysiologic feature of obesity, glucose intolerance, and hypertension, possibly explaining their ubiquitous association, and (c) may be linked to the increased peripheral vascular resistance of hypertension, which is putatively related to elevated intracellular sodium concentration (40).

2.3.7 High Cholesterol

Overview

Previous studies have shown the association between high cholesterol and hypertension as a risk factor of Coronary Heart Disease. Increasing levels of both total and LDL cholesterol are associated with increases in the risks of CHD (41). The relative risks appear to decline with increasing age, although the absolute risks typically increase. A 0.6 mmol/l (23.2 mg/dl) lower total cholesterol in men aged 40 years has been observed to be associated with a 54% lower CHD risk, whereas the same difference in cholesterol in men aged 70 years was associated with a 20% lower risk. The effect of HDL cholesterol on CHD risk does not appear to be age-dependent; every 0.03 mmol/l (1.2 mg/dl) increase in HDL cholesterol appears to be associated with at least a 3% reduction in the risk of CHD (42).

Findings of previous studies

A cross-sectional study of a case series was conducted to investigate the association between lipoprotein(a) (Lp(a)) and other plasma lipids and apolipoproteins and target-organ damage (TOD) among 277 untreated patients with mild to moderate essential hypertension and 102 healthy controls. Staging of TOD obtained according to World Health Organization guidelines by clinical evaluation, and laboratory tests including measurments of creatinine clearance, proteinuria, ophthalmoscopy, electrocardiography, echocardiography, and ultrasound examination of major arteries; levels of lipids, apolipoproteins, Lp(a), fibrinogen, and Apolipoprotein(a) (apo(a)) phenotypes. Blood pressure, duration of hypertension, and levels of total cholesterol, low-density lipoprotein cholesterol, apolipoprotein B, Lp(a), and fibrinogen were significantly related to the presence and severity of TOD in univariate analysis. Stepwise multivariate analysis showed Lp(a) levels (P<.001) to be the best discriminator of the presence of TOD, followed by systolic blood pressure (P<.001), duration of hypertension (P=.01), and low-density lipoprotein cholesterol (P=.04). The Lp(a) levels were related to TOD independent of the level of blood pressure. It was confirmed that the association between Lp(a) concentrations and severity of TOD in a second independent sample set and observed a significantly higher frequency of low-molecular-weight apo(a) isoforms with increasing severity of TOD (P=.02). As the conclusion, it was reported that Lp(a)and apo(a) phenotype are sensitive indicators of the severity of TOD in patients with essential hypertension, and their evaluation might permit identification of hypertensive subjects liable to the development of organ damage (43).

2.3.8 Health education

Overview

Education is an essential component of the management plan for every case of hypertension. In most countries of the Region, there is a serious lack of effort to educate people with hypertension and their families. Another important barrier to optimal management is that people with hypertension often do not realize that they have a role to play in controlling their blood pressure. There are also many misconceptions and myths that constitute an important obstacle to good control and

impede compliance with therapy. Examples of such misconceptions encountered in this Region include the belief that the absence of symptoms indicates blood pressure is normal and that headache indicates elevated blood pressure. Many people, and unfortunately some health care professionals, also believe that treatment should be stopped when blood pressure is brought under control. There are people who refuse to take medications because of the fear of adverse effects, such as impotence (44).

Findings of previous studies

To examine the association between hypertension incidence and education, data from the First National Health and Nutritional Examination Survey (NHANES I) Epidemiologic Followup Study (NHEFS) (1971–1984) was analyzed. The relative risk of hypertension incidence (blood pressure ≥160/95 and/or using antihypertensive medication) by education was calculated for non-Hispanic Whites (aged 25–64 years) and non-Hispanic Blacks (aged 25–44 years) normotensive at baseline using Cox proportional hazards models. The age-adjusted relative risk of hypertension incidence among persons with less than 12 years of education compared with those with more than 12 years was significant among non-Hispanic Whites aged 25–44 years (men: relative risk (RR) = 2.14, 95% confidence interval (CI): 1.29, 3.54; women: RR = 2.06, 95%CI: 1.39-3.05) but not among non-Hispanic Blacks (RR = 1.16, 95%CI: 0.63-2.14). Relative risks for non-Hispanic White men remained stable after adjusting for age, systolic blood pressure, body mass index, and region of residence; relative risks for non-Hispanic White women were reduced but remained significant. Non-Hispanic White men and women aged 45–64 years with less than 12 years of education were not at higher risk of developing hypertension compared with their more educated counterparts. These results demonstrate a significant interaction between age and education with an independent association between education and hypertension incidence among younger but not older non-Hispanic White men and women (45).

2.3.9 Sodium

Overview

From mid-century on, feeding experimental animals high-sail/ sodium diets was repeatedly shown to raise Blood Pressure (46) and data from observational studies in humans (47, 48) indicated a relationship between population average sodium intake and average blood pressure and/or prevalence of hypertension.

Sodium (Na^+) and chloride (Cl^-) are the principal ions in the fluid outside of cells (extracellular fluid), which includes blood plasma. As such, they play critical roles in a number of life-sustaining processes. Maintenance of membrane potential: Sodium and chloride are electrolytes that contribute to the maintenance of concentration and charge differences across cell membranes. Potassium is the principal positively charged ion (cation) inside of cells, while sodium is the principal cation in extracellular fluid. Potassium concentrations are about 30 times higher inside than outside cells, while sodium concentrations are more than 10 times lower inside than outside cells. The concentration differences between potassium and sodium across cell membranes create an electrochemical gradient known as the membrane potential. A cell's membrane potential is maintained by ion pumps in the cell membrane, especially the sodium, potassium-ATPase pumps. These pumps use ATP (energy) to pump sodium out of the cell in exchange for potassium. Their activity has been estimated to account for 20%-40% of the resting energy expenditure in a typical adult. The large proportion of energy dedicated to maintaining sodium/potassium concentration gradients emphasizes the importance of this function in sustaining life. Tight control of cell membrane potential is critical for nerve impulse transmission, muscle contraction, and cardiac function.

Nutrient absorption and transport: Absorption of sodium in the small intestine plays an important role in the absorption of chloride, amino acids, glucose, and water. Similar mechanisms are involved in the reabsorption of these nutrients after they have been filtered from the blood by the kidneys. Chloride, in the form of hydrochloric acid (HCl), is also an important component of gastric juice, which aids the digestion and absorption of many nutrients.

Maintenance of blood volume and blood pressure: Because sodium is the primary determinant of extracellular fluid volume, including blood

volume, a number of physiological mechanisms that regulate blood volume and blood pressure work by adjusting the body's sodium content. In the circulatory system, pressure receptors (baroreceptors) sense changes in blood pressure and send excitatory or inhibitory signals to the nervous system and/or endocrine glands to affect sodium regulation by the kidneys. In general, sodium retention results in water retention and sodium loss results in water loss. Below are descriptions of two of the many systems that affect blood volume and blood pressure through sodium regulation.

Renin angiotensin-aldosterone-system: In response to a significant decrease in blood volume or pressure (e.g., serious blood loss or dehydration), the kidneys release renin into the circulation. Renin is an enzyme that splits a small peptide (Angiotensin I) from a larger protein (angiotensinogen) produced by the liver. Angiotensin I is split into a smaller peptide (angiotensin II) by angiotensin converting enzyme (ACE), an enzyme present on the inner surface of blood vessels, and in the lungs, liver, and kidneys. Angiotensin II stimulates the constriction of small arteries, resulting in increased blood pressure. Angiotensin II is also a potent stimulator of aldosterone synthesis by the adrenal glands. Aldosterone is a steroid hormone that acts on the kidneys to increase the reabsorption of sodium and the excretion of potassium. Retention of sodium by the kidneys increases the retention of water, resulting in increased blood volume and blood pressure (49).

Specific quantities recommendations for salt/sodium intake for hypertensive patients have been available since the mid-1970s and have evolved over time. WHO set up the recommended amount of sodium intake to prevent hypertension , 2,400mg (6,000mg salt) per day. The U.S. recommendation is the same as WHO's (50). Recommended sodium intake in Japan is much higher than the universal standard, 3,200mg sodium (8,000mg salt), considering the peculiarity of Japanese food and feasibility of diet moderation (51).

The effect of high and low sodium intake on blood pressure and other related variables in human subjects with idiopathic heypertension: patients with idiopathic heypertension may be divided into two groups, "salt-sensitive", in which sodium loading increases blood pressure significantly, and "non salt-sensitive", in

which sodium loading does not effect. Non salt-sensitive patients excrete more sodium than salt sensitive patients (52).

Findings of previous studies

Randomized controlled trials in hypertensive patients indicate that reducing sodium intake by 80–100 mmol (4.7–5.8 g) per day from an initial intake of around 180 mmol (10.5 g) per day will reduce blood pressure by an average of 4–6 mmHg (53) or even more if combined with other dietary counseling (54), and enhance the blood-pressure-lowering effect of medication.

To determine the effect on blood pressure of two multicomponent, behavioral interventions, an intervention was conducted with enrollment at 4 clinical centers (January 2000-June 2001) among 810 adults (mean [SD] age, 50 [8.9] years; 62% women; 34% African American) with above-optimal BP, including stage 1 hypertension (120-159 mm Hg systolic and 80-95 mm Hg diastolic), and who were not taking antihypertensive medications. Participants were randomized to one of 3 intervention groups: (i) "established," a behavioral intervention that implemented established recommendations (n = 268); (ii) "established plus DASH,"which also implemented the DASH diet (n = 269); and (iii) an "advice only" comparison group (n = 273). Both behavioral interventions significantly reduced weight, improved fitness, and lowered sodium intake. The established plus DASH intervention also increased fruit, vegetable, and dairy intake. Across the groups, gradients in BP and hypertensive status were evident. After subtracting change in advice only, the mean net reduction in systolic BP was 3.7 mm Hg (P<.001) in the established group and 4.3 mm Hg (P<.001) in the established plus DASH group; the systolic BP difference between the established and established plus DASH groups was 0.6 mm Hg (P =.43). Compared with the baseline hypertension prevalence of 38%, the prevalence at 6 months was 26% in the advice only group, 17% in the established group (P =.01 compared with the advice only group), and 12% in the established plus DASH group (P<.001 compared with the advice only group; P =.12 compared with the established group). The prevalence of optimal BP (<120 mm Hg systolic and <80 mm Hg diastolic) was 19% in the advice only group, 30% in the established group (P =.005 compared with the advice only group), and 35% in the established plus DASH group

(P<.001 compared with the advice only group; P =.24 compared with the established group) (55).

2.3.10 Physical activity

Overview

Exercise is not only a controlling factor of hypertension, has been recommended for health promotion to prevent preventable chronic diseases. The interaction of regular exercise and physical fitness has received considerable attention as well as nutritional for the prevention of chronic diseases in recent years (56). Regular aerobic physical activity, adequate to achieve at least moderate level of physical fitness, has been shown to be beneficial for both prevention and treatment of hypertension (22).

Muscle fitness or resistance training with a light load may also lower elevated blood pressure in the manner of endurance exercise (57). The exercise recommendations of the American College of Sports Medicine (ACSM) for mildly or moderately elevated blood pressure are as follows:

1. 40 - 70% of VO2max, i.e. 55 - 80% of the maximal heart rate. The lower range of intensity is sufficient particularly for the aged
2. 3 or 4 times weekly for at least 30 minutes at a time
3. Various endurance sports are suitable; resistance muscle training (preferably circuit type) should not be the only form of training but should be combined with a endurance sport.

Increasing energy consumption is important for weight control and exercise is often recommended to increase burnt calories to reduce weight. Weight modification is of cause important factor to control blood pressure; meanwhile, it is reported adequate exercise greatly contributes to blood pressure moderation due to tension relief of sympathetic nerve after exercise and restoration of metabolism by peripheral vessels (51).

According to the National Statistics Office, Thailand, physical activity participation of people had increased from 21.3 in 1987 to 30.7 percent in 1997 and decreased to 24.2 percent in 2001. Males are greater physically active than

females. Urban people are also more physically active than the rural ones (Table 12). The survey by Suan Dusit Poll, Rajabhat Institute Suan Dusit, in 1998, also revealed that only 34.7 percent of Thai people achieve the recommended amount of regular physical activity. However, there was a notion that in certain areas, such as Bangkok Metropolitan Area, both males and females, after the crisis, performed less physical activity than before the crisis (Table 13).

Findings of previous studies

Epidemiologic data have shown that the risk of developing hypertension is closely related to being sedentary. Sedentary and unfit normotensive individuals have a 20-50% increased risk of developing hypertension (58).

The sedentary lifestyle common among the elderly may well be predisposing this population segment to hypertension and its sequelae. Those who participated in sports during college years were less likely to develop hypertension (59), and those engaged in vigorous sports during mid-life had a relatively low risk of developing hypertension (60).

Other research has found that physically active women aged 55 to 69 years had a 30% lower risk of developing hypertension (61). Those who have developed hypertension can benefit from engaging in physical activity.

In a recent meta-analysis of 47 studies assessing the effects of endurance exercise on individuals with essential hypertension, Hagberg (62) found that exercise training reduced systolic and diastolic blood pressure by 10.5 mmHg and 8.6 mmHg, respectively. Even low-intensity physical effort has been shown to cause declines in blood pressure (63).

Table 12 Percentage of people with routine physical activity, aged 15 years old and over, 1987-2001

Year	Total	Male	Female
1987			
Total	12.3	27.1	15.6
In municipal areas	32.1	39.6	24.7
Outside municipal areas	18.9	24.3	13.4
1992			
Total	25.7	31.8	19.7
In municipal areas	34.4	42.1	26.9
Outside municipal areas	23.8	29.4	18.1
1999			
Total	30.7	36.6	24.8
In municipal areas	34.0	41.0	27.5
Outside municipal areas	29.8	35.5	24.1
2001			
Total	24.2	29.1	19.3
In municipal areas	29.2	34.8	23.8
Outside municipal areas	21.7	26.4	17.0

Source: The preliminary summary report on health and welfare 2001, National Statistical Office, Thailand

Table 13 Physical activity behaviors of Bangkokian before and after the economic crisis period

Type	Before crisis (N = 1,155)		After crisis (N = 1,155)	
	Female (%)	Male (%)	Female (%)	Male (%)
Regular exercise	38.2	53.7	31.8	48.0
Occasional exercise	57.9	44.3	54.3	54.3
No exercise	3.9	2.0	13.9	13.9

Source: Survey of changing health behavior of Bangkokian due to the economic crisis, Thai Farmer Research Center, 1998

2.3.11 Stress

Overview

Socio-economic changes has contributed a lot in the field of health, on the other hand, has yielded psychological stress that could affect people's health condition. It happens to both developed and developing countries today.

Each person has his own peculiar way of solving problems in life with one and the same goal -- to live happily. On the whole, it may be said that the majority of people lack the coping ability, judging from the spiralling statistics of

divorce rates, and higher drug addiction rates in the people (64).

In the world without frontiers, any number of factors will have inevitable impact and repercussions on one another. Likewise, the rapid advances in technology and changes in the environment will affect every person in the world. The ability to adjust to the changing environment and prepare for unavoidable changes has become an absolutely important skill. Problems related to mental health are not the kind of problems that affect only any particular individual who has them, but they also have an impact on the surrounding people and the society at large. Mental health is inter-related and linked with innumerable factors. They include economic, political, educational, environmental, demographic, values and beliefs, and personal factors including genetic strains, health habits and coping with various problems, all of which affect and bring about rapid changes in the lifestyle, physical and mental health of the individuals (64).

For stress management, relaxation and meditation are becoming popular, and are recognized as controlling factors to prevent diseases. Ministry of Public Health, Thailand has included questions related to relaxation into the National Health Surveillance.

Findings of previous studies

An increasing number of workers in industrialized countries complain about psychological stress and overwork. These psychological factors have been found to be strongly associated with sleep disturbance and depression, as well as with elevated risks of cardiovascular diseases, particularly hypertension (65). "Job strain" (defined as high psychological demands and low decision latitude on the job) has been previously reported to be associated with increased risk of hypertension and increased left ventricular mass index (LVMI) in a case-control study of healthy employed men, aged 30- 60 years, without evidence of coronary heart disease (66).

Prevalence of hypertension has been increased in developing countries as a result of increased stress of urbanization (67). Other than the home environment, the workplace is the setting in which many people spend the largest proportion of their time. Indeed, for many people, particularly in developing countries, the boundary between their home and workplace environments is blurred, since they

often undertake agricultural or cottage industry activities within the home. Growth of the latter has often been spurred by population growth and rapid urbanization, in combination with economic development, and in parallel with larger, more conspicuous industrial development (68)

Chronic stress (feelings of fatigue, lack of energy, irritability, and demoralization) and hostility are linked to increased reactivity of the fibrinogen system and of platelets, both of which increase the risk of myocardial infarction (69). It is also reported that lack of control on the job increases the risk of coronary heart disease (CHD) (70). The National Heart, Lung, and Blood Institute (U.S.) concluded by their studies on the people who are lack of job control due to in high-demand/low achievement work setting, called "Type A", that Type A behavior was associated with increased risk of CHD in middle aged United States citizens in industrialized geographical area in 1981(71). The Type A behavior pattern is defined as an action-emotion complex stimulated by certain environmental events. It is believed to be influenced by Western cultural values that reward those who can produce in any capacity with great amounts of speed, efficiency and aggressiveness (72).

2.4 Summary

Hypertension itself tends to be recognized not a serious disease, however, previous studies have demonstrated that hypertension is a risk factor to cause cardiovascular and cerebrovascular disease that would directly lead death. Risk factors of developing hypertension are unchangeable and changeable. Aging is a factor that everyone inevitably face. Gender, ethnicity and genetic factor cannot be changed. It is also difficult to change socio-economic status. However, the risk to develop hypertension can be reduced by controlling changeable chronicle factors, such as: obesity, excessive sodium intake, lack of exercise, psychosocial stress, smoking habits, and alcohol consumption. Health education would play important role to modify those behavioral risk factors.

The definition of health promotion in the Otawa Charter is "enabling people to increase control over, and improve, their health." It implies that people can at

least partially control some of the determinants of their health. Hypertension is a preventable chronic disease. For the primary prevention, it is expected to identify risk factors or conditions first. Risk factor analysis would enable to reduce potential of developing preventable disease like hypertension through further health promotion activities.

This study seeks for association between hypertension and risk factor related to lifestyle. It is expected the results will be used for the future health promotion enhancement on blood pressure control in the studied area.

CHAPTER III
RESEARCH METHODOLOGY

3.1 Study Design

This study is a community-based case control study.

3.2 Study Area

The area of this study was Phutthamonthon District, Nakhon Pathom Province, Thailand. Phutthamonthon District is located in the west 18 km away from Bangkok. The District Hospital and 5 health centers; Wat Suwan, Salawan, Mahasawadi, Klongyoung 1 and 2, are stationed in the Phutthamonthon District Health Office jurisdiction.

3.3 Study Population

3.3.1 Selection of Cases

Cases were primarily selected from the blood pressure screening record (within 1 year) at the Phutthamonthon District Health Office. Blood pressure measurement was carried out once again for reconfirmation of real cases and controls. The case group also included new subjects who were not listed in the previous screening record but newly diagnosed as hypertensive by blood pressure measurement in communities

Inclusion criteria

Women aged 40 years and over whose SBP is $\geq$140 mmHg or DBP is $\geq$ 90 mmHg, according to the WHO-ISH hypertension guideline, and reconfirmed by the re-measurement of blood pressure for this study were the subjects of the case group. The maximum age for this study was determined to be 64 yeas by consideration of reliability to obtain effective answers. As an exception, 7 women

aged 65 to 67 years were included into the study subject due to unexpected difficulty to reach the control subjects in that age range, and then it was decided to include the same number of control subjects aged 65 to 67 years. The subjects who had been diagnosed as non-hypertensive by previous blood pressure screening but whose results of the re-measurement was ≥140/90 mmHg were re-classified into the case group. The case group also included the subjects who were not listed in the previous screening record but newly diagnosed as hypertensive by blood pressure measurement in communities.

Exclusion criteria

Women in pregnancy and lactation, or under treatment of infectious disease were excluded. Women who had developed secondary hypertension such as pulmonary and renal hypertension were also excluded from the selection of cases. Subjects whose blood pressure was already controlled to <140/90 mmHg without taking medication after the previous screening was classified into the control group.

3.3.2 Selection of Controls

Controls were also selected from the same blood pressure screening record (within 1 year) as that of case selection. Real controls were determined by the blood pressure re-measurement. As the case group included new subjects who were not listed in the previous screening record, the control group included such new subjects under inclusion criteria of control in this study

Inclusion criteria

Women aged 40 to 64 years diagnosed as having normal blood pressure (<140/90 mmHg) and reconfirmed by re-measurement were regarded as controls. Subjects in the previous case group whose blood pressure was controlled at <140/90 mmHg without taking medication after the previous screening were included to the controls.

Exclusion criteria

Women in pregnancy and lactation, or under treatment of infectious disease were excluded.

3.4 Sample size

Based on the study design of case and control, high sodium consumption behavior was considered as an exposure to hypertension (case status) in this study. However, there was no exact data available for the proportions of having high sodium consumption behavior among the subjects in this proposed study. Therefore, the estimated sample size was computed by using proportions of having high sodium consumption behavior among cases and controls obtained by a similar study in Thailand (P_1=28%, P_2=10%, OR=7.26) (73). With 95% confidence level and 80% power of the study, the required minimum sample size was calculated to be 74 for each cases and controls. According to the following formula:

$$n=\frac{(Z_{\alpha}\sqrt{2\bar{P}\bar{Q}}+Z_{\beta}\sqrt{P_1Q_1+P_2Q_2})^2}{(P_1-P_2)^2}$$

$$\bar{P}=\frac{P_1+P_2}{2} \qquad \bar{Q}=1-\bar{P}$$

Case : Control = 1 : 1

N = Estimated sample size

$Z\alpha$ = Value of standard normal deviation of Type I error (probability of study)

$Z\beta$ = Value of standard normal deviation of Type II error (power of study)

P_1 = Proportion of having high sodium consumption among the case group

P_2 = Proportion of having high sodium consumption among the control group

Q_1 =1- P_1

Q_2 =1- P_2

$$n=\frac{(1.96\sqrt{2\times0.19\times0.81}+0.84\sqrt{0.28\times0.72+0.1\times0.9})^2}{(0.28\times0.1)^2}=74$$

Finally, 115 samples for the case group and 109 samples for the control group were collected.

3.5 Sampling Technique

The subjects were selected by multi-stage sampling technique. The population of Phtthamonthon District has recently getting urbanized, and is mixed with people in both urban and rural life styles. The area was purposively selected for this study.

For determination of the number of sample that should be collected from respective health center areas, the previous blood pressure screening results were used. The sampling was decided to be age-matched, and the determined sample numbers were 66 for the group aged 40 to 54 years and 44 for the other group aged 55 to 64 years due to the proportion of its age range. The previous blood pressure screening record was divided into two different age groups, and the subjects were randomly selected from each age group. MINITAB Version 13.1 was used for the random sample selection. Area distribution was examined from the result of the random sampling of the case group, which was classified according to the WHO-ISH hypertension guideline, and the result of the distribution was determined as the number of the cases should be separately obtained from the district hospital and 5 health center areas. The sample number of the control was also determined by the same number as those of the case.

The sample was primarily collected by tracing names of the individuals in the roster that was randomly selected from the previous blood pressure screening record. Blood pressure measurement was carried out once again to every subject and medication use to lower blood pressure was examined to identify real case and control.

Since the population in Phutthamonthon District is dynamic due to the recently prosperous construction business and other urbanization factors, it was anticipated having a difficult situation to trace all the subjects from the previous screening record. New subjects who did not take the previous blood pressure screening were also included after checking their blood pressure and medication use. Figures 5 to 7 and Table 14 show the sampling method for the data collection in this study.

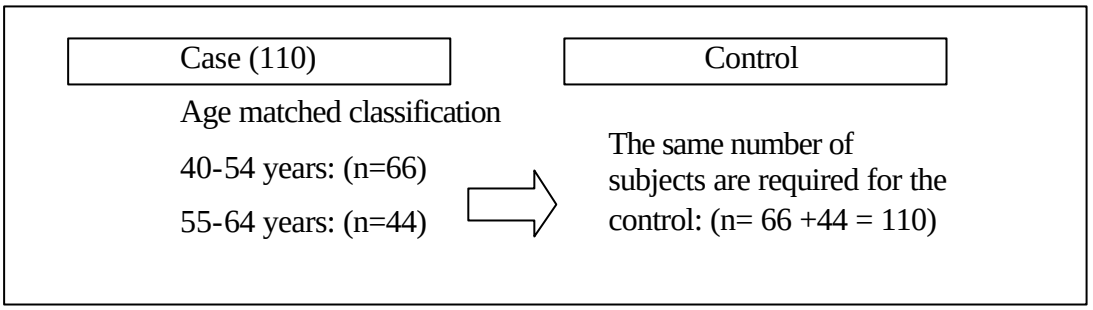

Figure 5: Determination of sample size for each age-matched case and control group

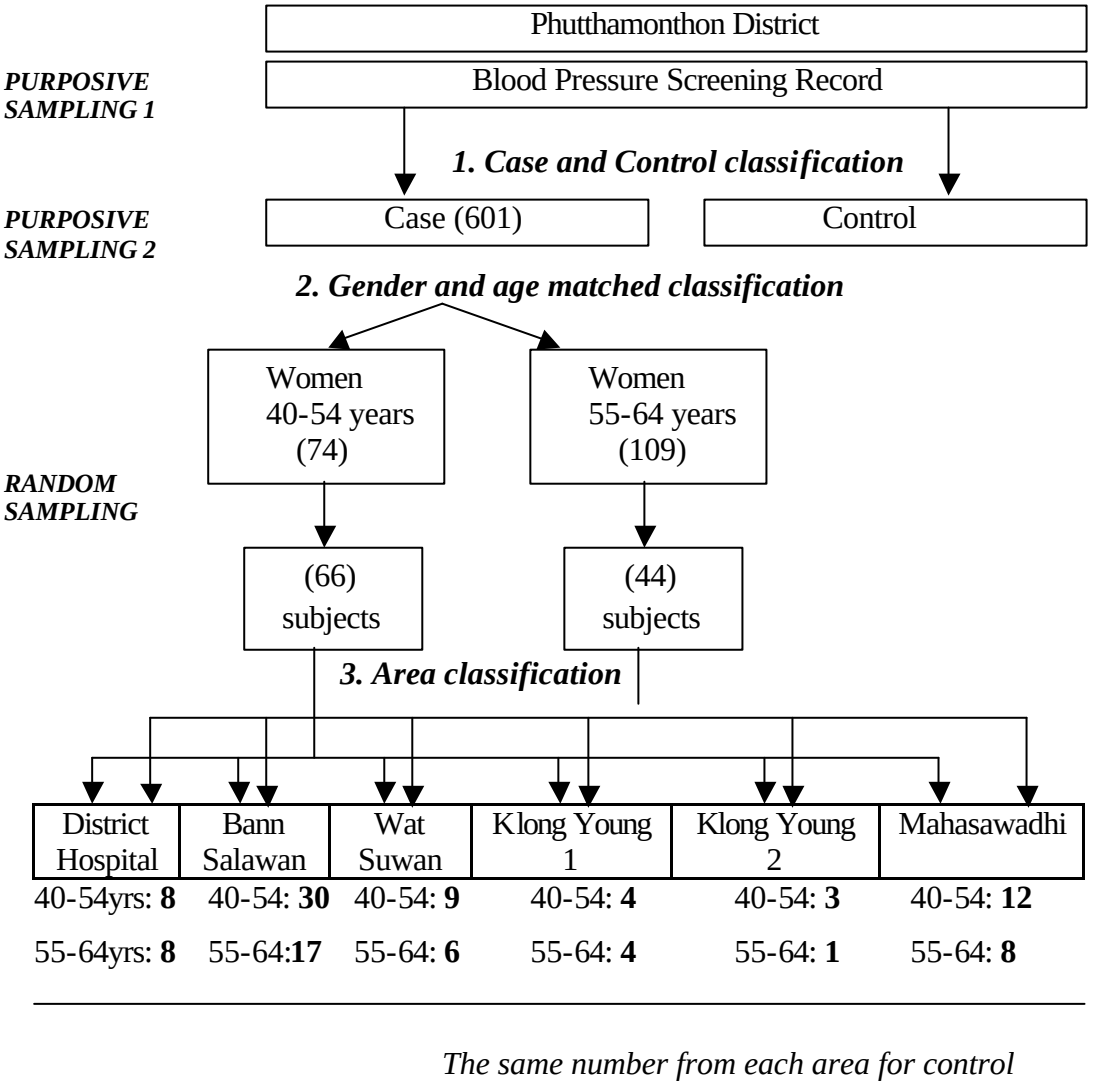

Figure 6: Determination of the number of subjects collected from each area

Table 14 Determination of the number of subjects from each health center area

Area	Case		Control		
	40-54	55-64	40-54	55-64	Total
Hospital	8	8	8	8	32
Bann Salawan HC	30	17	30	17	94
Wat Suwan HC	9	6	9	6	30
Klong Yong 1 HC	4	4	4	4	16
Klong Yong 2 HC	3	1	3	1	8
Mahasawadhi HC	12	8	12	8	33
Total	66	44	66	44	220

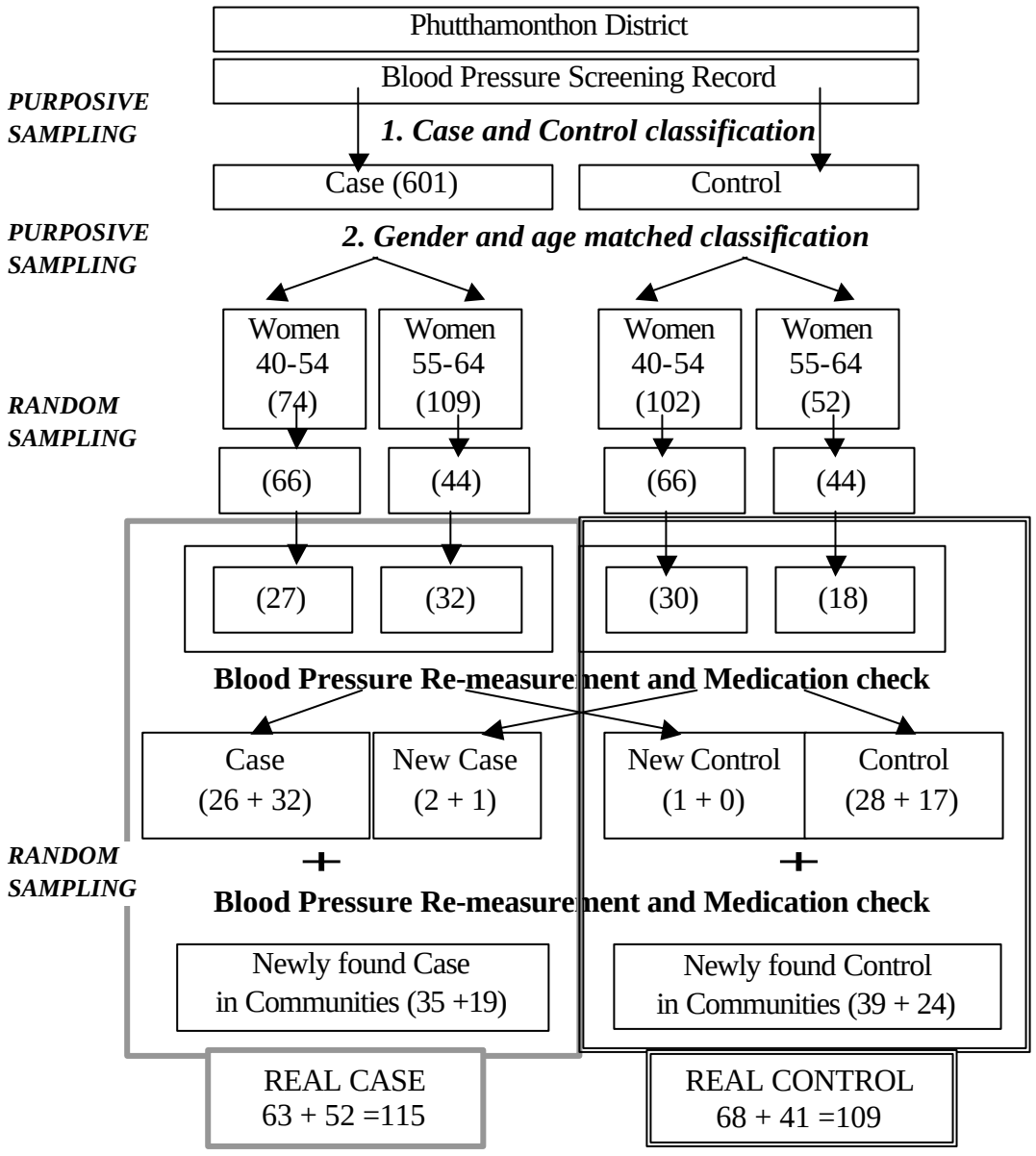

Figure: 7 Sampling method

3.6 Research Instrument

3.6.1 Instrument

A structured questionnaire was used as the instrument in this study.

3.6.2 Pre-test of questionnaire

Prior to the real data collection, pre-test of the questionnaire was conducted at the Phutthamonthon District Hospital and 30 samples were collected on 9 January 2004. The reliability of knowledge and perception assessment was analyzed with SPSS Version 11.5. Internal reliability of 8 questions for knowledge assessment had an alpha equal to 0.797. On the other hand, due to low internal reliability of perception assessment (0.310), the number of the questions was increased from 3 to 5 items. For multiple choice questions, the particulars that did not have even a single answer were revised.

3.6.3 Questionnaire

The questionnaire consisted of the following three parts:

Part I: Information of predisposing factors, such as:

1. Age, gender, occupation, educational background
2. Nutritional status (BMI) and health status (DM and high cholesterol)
3. Knowledge and perception on hypertension

Part II: Information of reinforcing and enabling factors, such as:

1. Supportive relationship and sources of information
2. Accessibility of health promotion and screening test

Part III: Information of behavioral factors, such as:

1. Dietary pattern
2. Physical activity pattern
3. Stress management

3.6.4 Scoring

3.6.4.1 Knowledge on hypertension

A correct answer to each question of the knowledge assessment was given 1 point, and false or "don't know" were not given any point. For determination of the cut-off point between good and poor knowledge, each question was examined on whether it should be answered correctly or hardly answered correctly according to the 3rd quartile of the result. Respondents answered correctly at least 75% to question 1, 6, and 8. Regarding these four as point-countable questions, the scoring for the knowledge assessment was determined as follows:

Correct Answer to Question 1: + 1 point

Correct Answer to Question 6: + 1 point

Correct Answer to Question 8: + 1 point

Question 2-5 and 7: point-uncountable

The cut-off point to classify the subjects into good or poor knowledge groups was set at 3 points as follows,

Good Knowledge: 3 points

Poor Knowledge: <3 points

3.6.4.2 Perception on hypertension

A three-point scale was used for the perception scoring, "agree", "not sure" and "disagree", the given points were, respectively, 3, 2, and 1. The questionnaire included 2 negative questions. Scoring for these 2 items was reversed; i.e., a "disagree" answer received 3 points. The total score was the summed up points of each question. The median score was used as the cut-off point to classify the perception levels, positive or negative as follows:

Positive perception: $\geq$ median score

Negative perception: $\geq$ median score

3.6.4.3 Sodium consumption behavior

For scoring the risk food assessment, approximate frequency of those risk foods a month was summed up and regarded as the risk point of the dietary assessment. Figure 8 shows the scoring example of the assessment.

Regarding the eating habits assessment, additional salty seasoning use with noodles was regarded as an indicator. The total score of this assessment was the product of scores of frequency of noodles eating a month, amount added of salty seasoning with noodles, and whether finishing all of the noodle soup or not. The calculation example of the total score of the eating habits assessment is shown in Figure 9.

Frequency of eating salty-food

Food	Frequency			
	times / day	times / week	times / month	Not eat
1. Spicy hot food (includes curry)		3		
2. Noodles		2		
3. Instant noodles			2	
4. Salted fish		2		
5. Salted egg			2	
6. Salted meat (pork, beef, chicken and duck)		1		
7. Processed food (sausage and fish-balls)		4		
8. Bread/ cracker with butter or cheese		3		
9. Canned fish or meat				○
10. Pickle	1			
11. Food with shrimp paste	1			
Sub-total	2	15	4	

⇩ ⇩ ⇩

times 30 (A):60 times 4 (B):60 times 1 (C):4

Total Score* = (A) + (B) +(C) = 60 + 60 + 4 = 124

**(Frequency of eating the listed risk food per month)*

Figure 8: Scoring example of risk food assessment in this study

1. Amount of salty seasoning used with noodles

	Fish Sauce	Nam Phrik	Other Sauce	Sugar	Vinegar	Chili	Other (Salt)
How many tea-spoon (A)	1/2			1	1	1/2	

	Fish Sauce	Nam Phrik	Other Sauce	Sugar	Vinegar	Chili	Other (Salt)
Na (mg/100g)	9,663	2,532	2,763	1	310	32	39,000
Coefficient (B)	1	0.26	0.29	0	0	0	1.8

1. Score of additional salty seasoning used with noodles
   = Sum [(A)*(B) of each item] = 2*1
   = **0.5**
2. Score of frequency of eating noodles a month
   (from the risk food assessment (Figure 8)
   = **6**
3. Finishing all of the noodle soup or not (**Yes: 2** / No: 1)
   = **2**

Total score of eating habits
= 1.*2.*3.
= 0.5*6*2
= **6.0**

Figure 9: Scoring example of eating habits assessment in this study

3.6.4.4 Pattern of physical activity

To approximate frequency and time duration per day, the burnt calories of each activity were calculated. Figure 10 shows an example for the calculation. The calculated amount of energy consumption is regarded as the score of each activity. The total score was the sum of the each score. Figure 9 shows the scoring example for this variable.

Frequency and duration of daily physical activities

Type of physical activities	Frequency days/week (A)	Duration hrs, min (B)	Energy Consumption (kcal/hour) (C)	Total (A)*(B)*(C)
1. Domestic duties: (inside of house, such as cooking, cleaning and doing laundry)	7	1h,30m	153**	6.5
2. Farming or gardening			0	0.0
3. Working (Seller)	5	7h, m	0*	0.0
3. Watching TV	7	2h, m	84**	840.0
4. Chatting with friends	6	h,20m	84**	1176.0
5. Sports: volleyball, aerobics, swimming and so on)	1	1h, m	260***	260.0
6. Others: Specify (Sewing)	2	1h, m	84**	168.0

* Follow Table 15: Additional energy consumption by occupation
** Follow Table 16: Activities and burnt calories
*** Follow Table 17: Exercise and burnt calories

Figure 10: Scoring example of assessment on pattern of physical activity in this study

Table 15 Additional energy expenditure by occupation

Level	Criteria	Additional Energy (kcal)		
		40-49 years	50-59 years	60-69 years
I	No occupation: spend the day mostly for sleeping, reading, watching TV, and listening to music	-200	-200	-200
II	Housewives, office workers, shop assistants and so on: spend at least 2 hours for domestic working, commuting, or walking in house or office	0	0	0
III	Farmers and the level II with more than 1 hour hard exercise such as running and swimming.	400	350	300
IV	Hard working farmers	750	700	600

Note: The table based on "Classification of level of occupational activity", Ministry of Health, Welfare and Labor, Japan 1999, and was modified to classify the subjects in this study.
The level III and IV do not need to add energy of column 2, 5 and 6 of the questionnaire

Table 16 Exercise and burnt calories

Mode of exercise	Calories (kcal/h)	Mode of exercise	Calories (kcal/h)
Running	850	Volley ball	210
Jogging	600	Brisk walking	330
Cycling: hard	640	Slow walking	190
Cycling: moderate	400	Dancing	210
Tennis	420	Aerobics*	260
Table tennis	280	Swimming	550

Source: Finnish Medical Society Duodecim, Physical activity in the prevention, treatment and rehabilitation of disease, Helsinki, Finland: Duodecim Medical Publication Ltd, 2002

* Source: Jun Fujii, Diabetes handbook, Daiichi Syuppan: 1992, Tokyo

Table 17 Physical activity and burnt calories

Mode of activity	Calories (kcal/h)	Mode of activity	Calories (kcal/h)
Office work	120	Driving	210
Domestic work	153	Typing	108
Gardening	276	Sewing and knitting	84
Watching TV (Sitting at rest)	84	Chatting (Sitting at rest)	84

Source: Energy expenditure: Physical activity, 50 plus Health http://www.50plushealth.co.uk/index.cfm?articleid=512

Type of physical activities	Total Energy Consumption (kcal)*
1. Domestic duties	1606.5
2. Farming or gardening	0
3. Working (Seller)	0
5. Sports: (such as volleyball, aerobics, swimming and so on)	260.0
6. Others: Specify (Sewing)	0*
Total	1866.5

* is from assessment on pattern of physical activity
* For energy consumption in inactive mood, 84 kcal is subtracted from burnt calories in each activity.

Figure 11: Scoring example of assessment on total amount of physical activity in this study

3.6.4.7 Stress

The frequency of 20 stress symptoms was asked for this assessment. According to the result analysis guideline of the questionnaire, the score scale is as follows:

Never: + 0 point
Sometimes: + 1 point
Often: + 2 points
Always: + 3 points

3.7 Data Collection

Data collection was carried out from 15 January through to 14 February 2004 by 6 well-trained Thai interviewers. Training for particular interview methods for the questionnaire of this study was provided to the interviewers. The aim of the training was to standardize their techniques of interviewing.

Data collection was carried out at the district hospital and heath centers first with the assistance of health staff, and successively carried out in the communities with assistance of village health volunteers. The questionnaire sheets were supplemented with face-to face interview. Health staff and the researcher carried out blood pressure measurement.

3.8 Data Processing

Collected data were entered into Microsoft Access 2000 file after qualitative data translation, and simple score calculations were conducted. The data were converted into MINITAB Version 13.1 file and cleaned. MINITAB Version 13.1 was continuously used for the data analysis. The Mantel-Haenszel adjusted analysis was calculated with EpiInfo 6.

3.9 Data Analysis

Descriptive statistics was applied to the independent variable, hypertension, and socio-demographic characteristics, and reinforcing and enabling factors present for its frequency distribution and percentage.

For the determination of the associations between blood pressure and each potential risk factor, Chi-square test for independence was applied. Odds ratio and 95% confidence intervals were also employed for dichotomous variables to examine the magnitude of associations and whether the associations were positive or negative.

CHAPTER IV
RESULTS

This is a case control study to determine the associations between factors related to life style, such as: sodium consumption, physical activity and stress; and hypertension. Data collection was conducted between 15 January and February 14, 2004 throughout Phutthamonthon District, Nakhon Pathom Province, Thailand, involving a total of 224 subjects with 115 hypertensive cases and 109 non-hypertensive controls. The results of this study are presented in three parts as follows:

Part I:	Description of dependent variable and its distribution
Part II:	Description of independent variables and their distribution, and analysis of association with hypertension
Part III:	Analysis of association between hypertension and its related factors
Part III:	Mantel-Haenszel adjusted analysis

4.1 Description of dependent variable and its distribution

Descriptive statistics for SBP and DBP is presented in Table 18. The median .of SBP among the cases was 140.0 mmHg, and 120.0 mmHg among the controls. The medians of DBP were 90.0 mmHg and 78.0 mmHg in case and control, respectively. Since almost one-third of the cases (29.9%) were taking medicine to lower their blood pressure and when SBP and DBP fall into different categories, the higher of them was applied (7), subjects with normal SBP or DBP and subjects with normal SBP and DBP were observed among the case group.

Table 18 Descriptive statistics for SBP and DBP

Variables	SBP		DBP	
	Case n=115	**Control** n=109	**Case** N=115	**Control** n=109
Median	140.0	120.0	90.0	78.0
Median difference (95%CI)	20.00 (18.00, 24.00)		14.00 (11.00, 17.00)	
Minimum	100.0	90.0	60.0	54.0
Maximum	220.0	139.0	129.0	88.0

4.2 Description of independent variables and their distribution, and analysis of association with hypertension

There were 224 women from different medical regions in Phutthamonton District as shown in Table 19. Age distribution in case and control is presented in Table 20. In this study, 63 case subjects and 68 control subjects aged 40-54 years and 52 case subjects and 41 control subjects aged 55-64 were selected with age range matching.

4.2.1 Socio-demographic factors

The socio-demographic characteristics of the subjects in this study are described in Table 21.

Occupation (Respondent)

The majority of the respondents run their own small businesses both among the case and control. (44.3% of cases and 40.3% controls)

Occupation (Husband)

"No occupation" was the majority both in cases and controls (23.5% of cases and 17.4% of controls). Most of them were already retired. Because they were widows or singles, nearly one-fourth of the subjects (19.2%) did not answer.

Educational background

As for educational background, almost all the subjects (93%) attained at least primary school education. Distributions of each educational level were very much alike. There was no statistical different between the cases and controls (χ^2 =1.25, p-value=0.741).

According to the results of socio-demographic analysis, it can be said that the case and control subjects are homogeneous.

Table 19 The subject composition

Area	Case				Control				Total	
	40-54 yr. n=63 (%)		55-64 yr. n=52 (%)		40-54 yr. n=68 (%)		55-64 yr. n=41 (%)		n=224 (%)	
District Hospital	10	(15.9)	9	(17.3)	5	(07.4)	4	(09.8)	28	(12.5)
Bann Salawan HC	30	(47.6)	23	(44.2)	38	(55.9)	20	(48.8)	111	(49.6)
Wat Suwan HC	8	(13.0)	6	(11.5)	9	(13.2)	4	(09.8)	27	(12.0)
Klong Yong 1 HC	4	(06.3)	4	(07.7)	3	(04.4)	4	(09.8)	15	(06.7)
Klong Yong 2 HC	3	(04.8)	1	(01.9	3	(04.4)	1	(02.4)	8	(03.6)
Mahasawadhi HC	8	(13.0)	9	(17.3)	10	(14.7)	8	(19.5)	35	(15.6)

Table 20 Age distribution in case and control

Age range	Case		Control		Total	
	n=115	(%)	n=109	(%)	n=224	(%)
40-44	14	(12.2)	23	(21.1)	37	(16.5)
45-54	49	(42.6)	45	(41.3)	94	(42.0)
55-64	45	(39.1)	34	(31.2)	79	(35.3)
>64	7	(06.1)	7	(06.4)	14	(06.3)

Table 21 Distribution of socio-demographic characteristics of the subjects in case and control groups

Socio-demographic characteristics	Case		Control		χ^2	P-value
	n=115	(%)	n=109	(%)		
Occupation (Respondent)						
Civil servant	4	(03.5)	7	(06.4)	9.87	0.130
Executive in private company	10	(08.7)	20	(18.3)		
Owner of small business	50	(43.5)	44	(40.4)		
Employee in private company	2	(01.7)	3	(02.8)		
Farmer	17	(14.8)	20	(18.3)		
Housewife	28	(24.3)	14	(12.8)		
Other	7	(06.0)	5	(04.6)		
Occupation (Husband)					4.75	0.577
Civil servant	11	(09.6)	16	(14.7)		
Executive in private company	10	(08.7)	15	(13.8)		
Owner of small business	2	(01.7)	2	(01.8)		
Employee in private company	12	(10.4)	17	(15.6)		
Farmer	19	(16.5)	15	(13.8)		
No occupation	27	(23.5)	22	(20.2)		
Other	10	(08.7)	6	(05.5)		
Educational background					1.25	0.741
No schooling	10	(08.7)	6	(07.1)		
1-6 years schooling	82	(71.3)	80	(72.3)		
7-12 years schooling	16	(13.9)	14	(13.4)		
>12 years schooling	7	(06.1)	9	(07.2)		

4.2.2 Nutritionalal Status

Table 22 shows the distribution of the subjects' nutritionala1 status (BMI). Obesity Class I was the biggest population both among case and control subjects when the subjects were classified into 5 groups according to the Asian standard classification. The median BMI among the cases was 25.8 and that among the controls was 24.4. The result of Chi-square test showed significant association between BMI and hypertension (p-value = 0.038). Table 23 shows the distribution of dichotomized BMI levels in case and control, with corresponding odds ratio. The risk of developing hypertension among the obese was approximately two times higher than the normal weight (OR =2.05, 95%CI = 1.62, 3.63).

Table 22 Distribution of nutritionalal status (BMI) in case and control

Nutritionalal Status		**Case**		**Control**		χ^2	**P-value**
(BMI kg/m2)		n=115	(%)	n=109	(%)		
BMI Classification						10.16	0.038*
Under Weight	(<18.5)	4	(03.5)	1	(02.2)		
Normal	(18.5-22.9)	23	(20.0)	36	(26.3)		
Pre-Obese	(23.0-24.9)	16	(13.9)	23	(17.4)		
Obesity Class I	(25.0-29.9)	49	(42.6)	34	(31.2)		
Obesity Class II	(≥30.0)	23	(20.0)	15	(13.8)		

Table 23 Distribution of dichotomized BMI levels in case and control, with corresponding odds ratio

Classification of BMI		**Case**		**Control**		**OR**	**p-value**
		n=115	(%)	n=109	(%)	95%CI	
Obesity	(≥25.0)	72	(62.6)	49	(45.0)	2.05	0.010*
Normal	(<25.0)	43	(37.4)	60	(55.0)	(1.62, 3.63)	

4.2.3 Health Status

Prevalence of diabetes and high cholesterol in case and control and its corresponding odds ratios are described in Table 24. Information of the subjects' health status was collected by self-report. In this study, about half in one-forth (11.6%) of the total subjects answered that they did not know whether they were diabetic or not, and around one fourth (25.9%) of them did not know their cholesterol level. Associations between health status and hypertension were examined without them.

Regarding the distribution of the diabetes report, the case group had more than double the proportion of diabetes subjects compared to the control group. Diabetes patients were at 2.42 times higher risk to develop hypertension in comparison with the subjects who were not diabetic (OR =2.42, 95%CI = 1.08-5.43).

Although the proportion of high cholesterol among the cases was 8.9% higher than that of the controls, statistical significance was not found (OR =1.72, 95%CI = 0.81-3.68).

Table 24 Distribution of diabetes and high cholesterol in case and control, with corresponding odds ratio

Health Status	Case		Control		OR	p-value
	n	(%)	n	(%)	95%CI	
Diabetes	n=97		n=101		2.42	0.028*
Yes	22	(22.7)	10	(09.9)	(1.08-5.43)	
No	79	(77.3)	87	(90.1)		
High Cholesterol	n=82		n=84			
Yes	21	(25.6)	14	(16.7)	1.72	0.158
No	61	(74.4)	70	(83.3)	(0.81-3.68)	

4.2.4 Cognitive and affective variables (knowledge and perception)

More than the third quartile of the subjects answered correctly to questions 1, 6 and 8 (82.6%, 83.0% and 90.6%, respectively). According to the previously determined scoring method, the subjects were divided into the group of good knowledge on hypertension and the group of poor knowledge. Table 24 shows the distribution of knowledge score and dichotomized knowledge levels, good and poor. A significant association was not found (p-value = 0.392).

Distribution of perception score and dichotomized perception levels in case and control are presented in Table 25. More than two-thirds of both cases and controls had rather positive perceptions on hypertension. The median scores of the cases and controls were both 13 points. The association between perception levels and hypertension was not statistically significant (p-value = 0.704).

Table 25 Score distribution, dichotomized levels of knowledge and perception in case and control

Knowledge level	Case		Control		χ^2	P-value
	n=115	(%)	n=109	(%)		
Good	**76**	**(66.1)**	**77**	**(70.6)**	3.00	0.392
3 points (full mark)	76	(66.1)	77	(70.6)		
Poor	**39**	**(33.9)**	**32**	**(29.4)**		
2 points	28	(24.4)	22	(20.2)		
1 point	9	(07.8)	5	(04.6)		
0 point	2	(01.7)	5	(04.6)		
Positive	**75**	**(65.2)**	**75**	**(68.9)**	4.64	0.704
15 points	41	(35.7)	36	(33.0)		
14 points	3	(02.6)	6	(05.5)		
13 points	31	(27.0)	33	(30.3)		
Negative	**40**	**(34.8)**	**34**	**(31.2)**		
12 points	11	(09.6)	9	(08.3)		
11 points	19	(16.5)	16	(14.7)		
10 points	1	(00.9)	4	(03.7)		
<10 points	9	(07.7)	5	(04.5)		

4.2.5 Reinforcing factors

Table 26 shows the distribution of the subjects' influential persons whom the subjects often talked about any health related issue with. About two-thirds of the cases and controls each (67.0%) selected health staff as an answer, and the answer was in the majority for both groups. The health staff, family and friends were among the influential people for the study subjects. Lesser (6.1%) of the case group least (4.6%) of the control group had no person to talk with about health issues.

Regarding information source of health related issues, the major information source was brochures or pamphlets from hospitals or health centers (53.0% of the cases, 48.6% of the controls). Family and friends were the second on the order for the influential person research (33.0% of the cases, 27.5% of the controls). Only 0.9% of both cases and controls had no information source (Table 26).

Table 26 Distribution of influential persons and information sources in case and control

Variables	Case		Control	
	n=115	(%)	n=109	(%)
Influential person				
Family	38	(33.0)	39	(35.8)
Friends	14	(12.2)	10	(09.2)
Health staff	77	(67.0)	73	(67.0)
Other	8	(07.0)	2	(01.8)
No	7	(06.1)	5	(04.6)
Information sources				
Books, magazines or newspaper	14	(12.2)	20	(18.3)
Brochure or pamphlet from Hospital or Health Center	61	(53.0)	53	(48.6)
Health promotion programs conducted by Health Center	11	(09.6)	19	(17.4)
TV or radio	3	(02.6)	7	(06.4)
Family member of friends	38	(33.0)	30	(27.5)
School education	8	(07.0)	10	(09.2)
Other	5	(04.3)	4	(03.7)
No information	1	(00.9)	1	(00.9)

4.2.6 Accessibility

Accessibility was measured by the subjects' attendance in health promotion and screening programs last year. The distribution is described in Table 27. Almost two-thirds (65%) of both cases and controls joined at least health screening programs. A slightly higher percentage of the controls joined both health promotion and screening programs than the cases (20.4% of the cases and 27.1% of the controls). More than one-thirds of the whole subjects joined neither program (43.0% of the cases and 30.8% of the controls).

Knowledge with accessed about the programs was asked among the subjects who joined at least either health promotion or screening programs from the accessibility research. The frequency is presented in Table 28. The question was asked on a multiple choice answer sheet. Some of the subjects received the information from more than one source. Almost one-thirds of the subjects (32.0%) were informed about the programs by health staff; about one-fourth (24.7%) of them

got the information by brochure from hospital or health center. Checking the information by individuals and getting the information from working places were included with "other".

The reasons why the subjects did not join the programs was asked among those who did not join either health promotion or screening programs, or both. Table 28 also shows the frequency; more than one-thirds (39.9%) of all the subjects answered they were busy with their work and fewer above one-fourth (27.5%) of them were confident about their health so that they thought it was not really necessary to join the programs.

Table 27 Distribution of accessibility: attendance in health promotion and screening programs in case and control

Attendance to health promotion and screening programs	**Case**		**Control**	
	n=113	(%)	n=107	(%)
Joined both	23	(20.0)	29	(27.1)
Joined health promotion program	1	(00.9)	3	(02.8)
Joined health screening program	43	(38.1)	42	(39.3)
Joined neither program	46	(40.7)	33	(30.6)

Table 28 Frequency distribution of information sources of health promotion or screening program and reasons for not joining the programs

	Frequency	
	n	(%)
Information sources of health promotion or screening program	= 150	
Health staff	48	(32.0)
Village Health Volunteer	19	(12.6)
Brochure	37	(24.7)
Leader in community	14	(08.7)
Neighbors	7	(09.3)
Others	28	(18.7)
Reasons why not to join the programs	= 153	
No information	16	(10.5)
Busy with work	61	(39.9)
Unfavorable location of household	10	(06.5)
No need to join them because of in good health	42	(27.5)
Others	32	(20.9)

4.2.7 Sodium consumption behavior

Two different types of questionnaires assessed sodium consumption behavior. One was risk food (salty-food) consumption assessment and the other was eating habits assessment. The score of each assessment was not normally distributed (p-value <0.0001 for risk food consumption assessment and p-value < 0.0001 for eating habits assessment). Table 29 shows the score distribution of the risk food and eating habits assessments in case and control.

The median score of the control group was slightly higher than that of the case group (case: 40 and control: 44), and the majority of the cases belonged to a score range more than 20 to 40 points, while the majority of the controls belonged to a score range of more than 40 to 60 points. A statistical significance for the association between risk food consumption and hypertension was not found (p-value = 0.502).

Regarding eating habits assessment, the questionnaire sought for additional salty seasoning use. Additional seasoning use with noodles was looked into as an indicator. The majorities of the cases and controls were at moderate risk of the eating habits (84.2% of case and 84.3% of control belong to a score range of less than 25). On the other hand, the proportion of the subjects whose score was equal or more than 50, were regarded as higher risk takers, in terms of excessive sodium consumption by additional salty seasoning use among the cases was nearly three times higher than those among the controls. A statistical significance was found for the association (p-value = 0.038).

4.2.8 Physical activity

The magnitude of physical activities was assessed by questionnaire asking frequency and duration of each item of daily physical activities. Score of the physical activity assessment was not normally distributed (p-value < 0.0001). The score distribution of the physical activity assessment in case and control is also presented in Table 29. The median score of the cases happened to be was 2,771, and of the controls was 2,953. The majority of both groups belonged to the score range of 2,000 to 4,000 (45.2% of the cases and 50.2% of the controls). A statistically

significant association between the magnitude of physical activity and hypertension was not found (p-value = 0.243).

Table 29 Score distribution of the assessments on behavioral factors in case and control

Score		Case		Control		χ^2	P-value
		n	(%)	n	(%)		
Risk food consumption		=115		=109			
≤20	(Moderate)	24	(20.9)	18	(16.5)	4.34	0.502
>20-40		35	(30.4)	29	(26.6)		
>40-60		25	(21.7)	37	(33.9)		
>60-80		16	(13.9)	14	(12.8)		
>80-100		8	(07.0)	6	(05.5)		
>100	(High)	7	(06.1)	5	(04.6)		
Eating habits		=114		=108			
≤25.0	(Moderate)	96	(84.2)	91	(84.3)	6.56	0.038*
>25.0-50.0		6	(05.3)	13	(12.0)		
>50.0	(High)	12	(10.5)	4	(03.7)		
Physical activity		=115		=109			
≤2,000	(Less)	24	(20.9)	20	(18.4)	6.71	0.243
>2,000-4,000		52	(45.2)	55	(50.5)		
>4,000-6,000		24	(20.9)	12	(11.0)		
>6,000-8,000		4	(03.5)	7	(06.4)		
>8,000-10,000		3	(02.6)	7	(06.4)		
>10,000	(High)	8	(07.0)	8	(07.3)		
Stress		=115		=109			
Stress level I	0-5	66	(57.4)	73	(67.0)	4.77	0.312
Stress level II	6-17	24	(29.9)	23	(21.1)		
Stress level III	18-25	8	(07.0)	5	(04.6)		
Stress level IV	26-29	2	(01.7)	2	(01.8)		
Stress level V	30-60	15	(13.0)	6	(05.5)		

4.2.9 Stress assessment

The standard questionnaire for stress assessment in Thailand was used in this study. The distribution of the five-level classified stress magnitude is in Table 29. The subjects whose stress score was 0-5 points were classified into the stress level I group, 6-17 points were into the level II, 18-25 points were into the level III, 26-29 were into the level IV, and 30-60 points were into the level V groups. The

median score of the cases was 4, and of the controls was 3. The majority of both case and control was at stress level I (57.4% of the cases and 67.0% of controls). While only 5.5% of the controls was at stress level V, the case group had more than double the proportion (13.0%) at the same stress level. Statistical significance was not found for association between stress level and hypertension in this level classification.

When the subjects were classified into high or normal stress groups with the standard cut-off point of this assessment, which was 18 points (Table 30). The subjects at high stress level were 2 times more likely to develop hypertension than the subject at normal stress level, but a statistical significance was hardly found on the association (OR = 2.05, 95%CI = 0.99-4.25).

Table 31 shows the distribution of methods of the subjects' stress management in case and control. Chatting with friends and doing something related to religion were the major stress management methods among the case group, and following was taking an afternoon nap. The majority of the controls was managing their stress by taking an afternoon nap (27.5%). The second majority was "other" (22.9%), including watching TV, talking with husband, meditation, reading, and so on. The proportion of the subjects who had nothing special to manage their stress among the cases was 2.5 times larger than among the controls.

Table 30 Distribution of dichotomized stress levels in case and control, with corresponding odds ratio

Stress level	**Case**		**Control**		**OR**	**p-value**
	n=115	(%)	n=109	(%)	**95%CI**	
High stress	25	(21.7)	13	(11.9)	2.05	0.050*
Normal	90	(78.3)	96	(88.1)	(0.94-4.54)	

Table 31 Distribution of methods of stress management in case and control

Distribution of methods of stress management	Case		Control	
	n=115	(%)	n=109	(%)
1. Sports.	7	(06.1)	5	(04.6)
2. Chatting with friends	33	(28.7)	42	(03.9)
3. Shopping	5	(04.3)	5	(04.6)
4. Eating	2	(01.7)	1	(00.9)
5. Thai-massage	3	(02.6)	5	(04.6)
6. Listening to music	9	(07.8)	13	(11.9)
7. Something related to religion	33	(28.7)	18	(16.5)
8. Taking an afternoon nap	30	(26.1)	30	(27.5)
9. Nothing special	20	(17.4)	6	(05.5)
10. Others	18	(15.7)	25	(22.9)

4.3 Association analysis between independent variables

According to the study objectives, this part was to seek for associations between independent variables. Cognitive and affective variables were anticipated as influential factors to behavioral factors.

The knowledge assessment questionnaire in this study contained questions related to behavioral factors, sodium consumption behavior, pattern of physical activity and stress management. Table 32 shows the distribution of correct or false answers to questions according to related variables.

Regarding the association between risk food consumption and knowledge on association between salty food and hypertension, there was no statistical significance for the association (p-value = 0.710).

Associations between eating habits (additional salty seasoning use) and knowledge on association between salty-food and hypertension was also examined. A statistical significance was not found (p-value = 0.792).

Concerning association between knowledge and physical activity, more than 80% of the subjects correctly answered one question on the association

between exercise and hypertension in the knowledge questionnaire. Distribution of physical activity levels among the correct group was not much different from those who did not know the correct association. There was no statistical significance (p-value = 0.740).

Knowledge on association between stress management and hypertension was predicted to affect having some kinds of stress management. In this regard, 71.4% of the subjects correctly answered questions on associations between hypertension and both meditation and recreation. A statistical significance was not found on the association of knowledge and stress management practice (p-value = 0.262).

Table 32 Distribution of dichotomized behavioral factor levels in the good and poor knowledge groups

Behavioral factor level		Knowledge Correct		Knowledge False		χ^2	P-value
		n=	(%)	n	(%)		
Risk food consumption		=144		=80		2.93	0.710
≤20	(Moderate)	30	(20.8)	12	(15.0)		
>20-40		40	(27.8)	24	(30.0)		
>40-60		38	(26.4)	24	(30.0)		
>60-80		17	(11.8)	13	(16.3)		
>80-100		10	(06.9)	4	(05.0)		
>100	(High)	9	(06.3)	3	(03.8)		
Eating habits							
≤25.0	(Moderate)	120	(84.5)	67	(83.8)	0.47	0.792
>25.0-50.0		11	(07.8)	8	(10.0)		
>50	(High)	11	(07.8)	5	(06.3)		
Physical activity		=186		=38		2.74	0.740
≤2,000	(Less)	35	(18.8)	9	(23.7)		
>2,000-4,000		87	(46.8)	20	(52.6)		
>4,000-6,000		30	(16.1)	6	(15.8)		
>6,000-8,000		10	(05.4)	1	(02.6)		
>8,000-10,000		9	(04.8)	1	(02.6)		
>10,000	(High)	15	(08.1)	1	(02.6)		
Stress management		=160		=64		1.26	0.262
Yes		139	86.9	59	92.2		
Nothing special		21	13.1	5	7.8		

4.4 Mantel-Haenszed adjusted analysis

For the determination of risk factors of hypertension among the study subjects, the Mantel-Haennszed adjusted analysis was applied to identify confounding factors.

4.4.1 BMI stratified analysis in associations between hypertension and health status (diabetes)

Previous studies have shown significant associations between nutritionalal status, diabetes and hypertension. Although the association analysis of hypertension and diabetes in this study also showed statistical significance, it was

anticipated that nutritionalal status, which showed strong statistical association with hypertension, might confound the association between hypertension and diabetes.

Associations between hypertension and diabetes, before and after stratifying BMI is presented in Table 36. The risk difference to develop hypertension among the diabetic and among the non-diabetic was hardly found while its significance became much stronger after controlling nutritionalal status (Crude OR =2.42, 95%CI = 1.08-5.43, Adjusted OR = 2.34, 95%CI = 1.26-4.38).

On the process of this analysis, it was found the risk to develop hypertension became remarkably high when two risk factors, obesity and diabetes, conspired. Although a statistical significance was not found on the association between diabetes and hypertension among the BMI normal, the obese diabetic were at approximately 4 times higher risk to develop hypertension in comparison with the obese who were not having diabetes (OR =4.10, 95%CI = 1.17-15.72).

Table 33 Association between hypertension and diabetes, before and after stratifying with BMI

Stratified Variable (BMI)	**Hypertension**	n	**Diabetes**	n (%)	**OR (95%CI)**	**p-value**	**Adjusted OR (95%CI)**	**p-value**
	Case	97	Yes	22 (22.7)	2.42 (1.08-5.43)	0.028*		
	Control	101	Yes	10 (9.9)				
BMI<25	Case	38	Yes	4 (10.5)	0.90 (0.19-4.01)	0.880	2.34 (1.26-4.38)	0.005*
	Control	52	Yes	6 (11.5)				
BMI≥25	Case	63	Yes	18 (28.6)	4.10 (1.17-15.72)	0.012*		
	Control	45	Yes	4 (8.9)				

CHAPTER V
DISCUSSION

The increase in prevalence of hypertension is one of the major health issues in Thailand today. This study was to determine the associations between factors related to life style, such as sodium consumption behavior, pattern of physical activity and stress management. Those factors were regarded as the behavioral factors, and were predicted as the risk factors to develop hypertension in this study. Nutritionalal status (BMI) and health status (diabetes and high cholesterol) were also predicted as the risk factors that directly affect blood pressure. The associations between hypertension and those predicted risk factors were examined. Socio-demographic characteristics and cognitive and affective variables were regarded as the predisposing factors, supportive relationship and sources of health information were considered as the reinforcing factors, and accessibility of health promotion and screening programs were regarded as the enabling factors, which have associations between hypertension or behavioral factors of hypertension. Based on the theory of the PRECED model, association analysis between the potential risk factors was carried out.

This study was not able to find statistically significant associations between hypothesized behavioral factors and hypertension, while highly significant associations between predicted physical factors and hypertension appeared. Even without statistical significance, some points that deserve to be highlighted were found for the inter-associations of predicted risk factors.

Socio-demographic factors

Research of the subjects' occupation tells us the socio-economical characteristics of the study population. People in Phutthamonthon District are a mix of both rural and urban populations. However, the study population consisted of mostly residents who are running small business very close to their house or who stayed at home. Since data collection was conducted during working days (Monday

to Saturday), this became a limitation of this study. Although the study area has people at different socio-economic levels, the distribution of the occupation indicated that the study subjects were almost at the same socio-economic level. It can be said that the case subjects and control subjects were homogeneous

Cognitive and affective variables

A statistically significant association between knowledge levels and hypertension was not found (p-value = 0.392). Focusing on knowledge of risk factors related to life style such as salty food and less exercise, the percentage of correct answers among the cases was somewhat higher than among the controls. It was observed that heath centers are taking care of those who have been diagnosed as having hypertension. Once people are diagnosed as hypertensive, they are asked to go to a health center regularly to check their blood pressure. Hospital and health centers set up one day for hypertension clinic every week. The more often people go to health center, the more information related to health they can obtain. More than two-thirds of the cases (72%) had known that they are hypertensive. They are likely to have many more opportunities to know how to control their blood pressure by modifying their life style.

It was also observed that people in the study area regard that mental health is important to control chronic diseases. The importance of exercise has been recently well-informed to even people in rural areas. However, the importance of diet is not well-nown. The frequency and percentage of correct answers in the knowledge assessment was not against the observation. Even though the importance of exercise for health is well-known, the importance of keeping appropriate weight is not well understood. Only half of the whole study population correctly answered that there is a relationship between obesity and hypertension.

A statistically significant association between perception and hypertension was not found (p-value = 0.704). According to this, 77.4% of the cases and 65.1% of the controls believe that hypertension is serious disease; nevertheless, 87.0% of the cases and 88.1% of the controls are optimistically agreed that

hypertension does not really matter because medicine can control. Here is the contradiction. Although it is presumed that people are scared to develop hypertension, they trust the effect of medicine. The recently introduced universal coverage policy might influence people not to worry about medical expense including medicine fee.

It might be a predictable result that most of the subjects are reluctant to modify diet to control blood pressure. Former questions already indicated that people trust and rely on medicine. Without enough knowledge of the importance of diet modification, it is natural that people tend to feel difficulty in modifying their diet and take medicine to control the disease.

Associations between knowledge and behavioral factors were expected to be found in this study; however, a statistical significance was not found. In other words, the results of the statistical tests clearly explained the difficulty to carry knowledge into practice. More than 60% of the subjects were aware that there is an association between salty food and hypertension. Yet it did not affect their sodium consumption behavior in this study. Statistical significance on the association of knowledge with risk food consumption was 0.464, and with eating habits was 0.964. Likewise, significance on the association between knowledge and practice of regular exercise was not found (p-value = 0.160). However, a proportion of the subjects who regularly practice some exercise among the subjects with correct knowledge was more than 10% higher than among the subjects without correct knowledge. In terms of behavioral change, starting some exercise may be easier than diet modification. Regarding stress management, there is no statistical significance (p-value = 0.262). No any remarkable observation on association between knowledge and stress management was found. More details of behavioral analysis will be described later in this chapter.

Nutritional status

As previous studies have indicated, this study also shows a significant association between nutritionalal status and hypertension. The results indicated the risk to develop hypertension among the obese is 2.05 times higher than

normal weight people (p-value = 0.01).

The prevalence of obesity in this study was 54.0%. It is higher than previous studies conducted among the same age population in Thailand. A recent study on hypertension and obesity among working populations in Bangkok showed that 29.5% of women aged 45 to 64 years had obesity (22). The difference might be the difference between rural and urban areas. According to the results of additional research on traditional and modern beliefs of women's appearance, 73.2% of the subjects in this study agreed that a fat person does not look nice. On the other hand, 84.0% of the same subjects agreed that women should be a little fat because it looks healthy. Age has no association with the answer distribution of those additional questions (p-value = 0.787: agree to not fat and p-value = 0.905: agree to a little fat). Although a significant association was not found between the traditional and modern beliefs and the subjects' nutritionalal status (p-value = 0.267), the proportion of the subjects who agreed to be a little fat among the obese is approximately 10% larger than the normal nutritionalal status group. It seems that people's believes on appearance slightly affect their nutritionalal status.

Health status

A statistical significance between diabetes and hypertension was found (OR =2.42, 95%CI = 1.08-5.43).

The prevalence of diabetes among the obese was almost twice that among the normal weight subjects in this study (20.4% among the obese and 11.1% among the normal). The risk to develop hypertension was seemingly affected by a combination of those two risk factors. Since previous studies have shown significant associations between nutritionalal status, diabetes, and hypertension, it was predicted that nutritionalal status might confound the association between diabetes and hypertension. The Mantel Haenzel adjusted analysis was applied to confirm the associations between three variables, nutritionalal status, diabetes, and hypertension. However, the risk difference before and after controlling nutritional status was almost the same while a significance of the adjusted odds ratio became much stronger

(Adjusted OR = 2.34, 95%CI = 1.26-4.38). Nutritional status was not a confounding factor of the association. On the other hand, it was confirmed that the risk to develop hypertension became remarkably high when two risk factors, obesity and diabetes, conspired. The obese people with diabetes were at approximately 4 times higher risk to develop hypertension in comparison with the obese who were not having diabetes (OR =4.10, 95%CI = 1.17-15.72, p-value = 0.012). Among the study populations, 81.8% of the subjects who were both obese and diabetic had developed hypertension. Having diabetes did not affect blood pressure status among the BMI normal subjects. (OR =0.90, 95%CI = 0.19-4.01).

The people who had been diagnosed as having diabetes usually tend to patients usually have more opportunities to access to health services and information. Having diabetes was also predicted as a confounding factor of association between cognitive and affective variables and hypertension. However, an association with statistical significance was not found between the variables (p = 0.224). In this particular study population, knowledge levels on hypertension among the diabetes patient did not differ from among the non-diabetic.

Influential persons and sources of information

The result of descriptive statistics on reinforcing factors showed that health staff have important roles on health in the study area. Distribution of the subjects' information sources showed brochures and pamphlets from hospitals or health centers strongly support the subjects in obtaining health information. Family members and friends are also influential persons to almost half of study subjects. It seems that strong family relationship still remained and inter-personnel relationship in communities is strong in Thailand. In this situation, the subjects who have no person to talk over health issues could be very close to zero. Of the subjects 5.4% answered that they have no one to share health issues.

Accessibility

Attendance in health promotion and screening programs last year was regarded as the indicator of the accessibility assessment in this study.

Aerobics programs have been organized by health centers. One fourth of the study subjects joined such health promotion programs. Hospital and health centers also provide health screening programs. Blood pressure measurement with life style interview started in March 2003. Data collection was primarily carried out following the screening results and more than two-thirds of the subjects answered that they joined health screening programs. Accessibility in this study is not really the accessibility of all the population in the study area and it is naturally supposed that the real accessibility is much smaller than the result of this study. It was reported the major hindrance to join health programs was busy working conditions. Self-confidence on health was the second major reason why the subjects did not join the programs.

Sodium consumption behavior

Sodium consumption behavior was assessed by frequencies of salty food and additional salty seasoning use. A statistical significance on the association between sodium consumption behavior and hypertension was not found (p-value = 0.502 for the salty food assessment and p-value = 0.377 for the additional salty seasoning use assessment).

The association between sodium, body fluid and blood pressure was the scientifically proved fact (49), and previous studies have shown the effects of moderation of sodium intake to blood pressure status (53-55). In the U.S., the recommended moderation of sodium intake on prevent hypertension is 2,400 mg (6,000 mg salt). The WHO's recommendation is the same as the recommended amount of sodium intake in the U.S. Excessive sodium consumption is not only the risk factor to develop hypertension; however, there is a certain amount of sodium intake recommended to prevent hypertension. It is required to conduct a 7 day food frequency recording method or 7 to 14 day 24 hour recall dietary assessment to figure out the specific amount of each nutritional intake (13).

This presented is a difficulty in this study to assess whether the subjects are taking the proper amount of sodium or excess, due to limitations of study

duration and research personnel. The questionnaire for dietary assessment in this study was made applying the methods of the Behavioral Risk Factor Surveillance System (BRFSS) and the Kristal's Eating Pattern Questionnaire. When a number of certain foods are predicted to develop certain disease, such risk food surveillance and eating pattern assessment were systematic methods. The most difficult point to assess salty food consumption behavior in this study was the determination of the cut-off point to classify the subjects into moderate or risk groups. There is no standard model of recommended sodium intake in Thailand. The median score of the risk factor assessment was 40 in the cases and 44 in the controls. The score distribution of the risk food consumption indicated the cases were at lower risk in terms of salty food consumption. One possible reason to explain such a distribution is that the subjects are mostly under the recommended sodium amount to prevent hypertension.

Without statistical significance, another finding is among the high risk subjects in the control group. Only a control subject in the age range of 55 to 64 years was at high risk of sodium consumption. The number of subjects belonging to this detailed classification was not enough for the statistical test; however, it was observed that the possibility not to develop hypertension among the subjects at high risk of sodium consumption becomes smaller as age increases. This tendency was found in the subjects whose scores of the risk food assessment were more than 60 (Table 39 Appendix B). Although there is no statistically significant information to affirm, it can be predicted that people who regularly eat the listed salty food more than twice a day are much more likely to develop hypertension after age 55 years and over.

For the determination of a certain cut-off point to divide people in high or moderate risk groups, dietary assessment should be conducted in more details.

Regarding eating habits assessment, the majorities of the cases and controls were at moderate risk of the eating habits (84.2% of case and 84.3% of control belong to a score range of less than 25). On the other hand, the proportion of

the subjects whose score was equal or more than 50 and regarded as high risk takers in terms of excessive sodium consumption by additional salty seasoning use among the cases was nearly three times larger than those among the controls. A statistical significance was found on the association between the eating habits and hypertension (p-value = 0.038). Risky sodium consumption behavior was rather attributed to additional salty seasoning use than the frequency of salty food intake among the study subjects.

Physical activity

Statistical significance on the association between the magnitude of physical activity and hypertension was not found (p-value = 0.243). It might be much more difficult to see the effects of prevention than to see the effects of intervention. Previous studies have shown favorable results of exercise interventions to lower the subjects' blood pressure (56-63). Increasing energy consumption is important for weight control and exercise is often recommended to increase burnt calories to reduce weight. Weight modification is, of course an important factor to control blood pressure; meanwhile, it is reported that adequate exercise greatly contributes to blood pressure moderation due to tension relief of the sympathetic nerve after exercise and restoration of metabolism by peripheral vessels (51).

It was also difficult to set up the cut-off point to classify the subjects into less or adequate physical activity levels. Adequate energy consumption depends on individuals, by age, weight, and amount of energy intake. Only the proportion of subjects who were classified as having less physical activity among the cases was around 10% larger than among the controls.

Stress assessment

The questionnaire was designed to assess physical, emotional and behavioral symptoms of stress. Most physical symptoms in the questionnaire were also the symptoms of hypertension, such as headache, palpitation of the heart, myofascial pain at back, neck or shoulder, and dizziness. This might be one of reasons to explain that the cases marked somewhat higher total scores of this

assessment (the median total score of the cases: 4.0, and of the controls: 3.0). Although the subjects at high stress level were roughly twice more likely to develop hypertension than subjects at normal stress level, a statistical significance on the association between stress and hypertension was not found (OR = 2.05, 95%CI = 0.99-4.54). According to the statistical values, a significance might have appeared if sample size of this study had been a little more larger.

From the observation during data collection, it seems the subjects already obtained quit a few of information of risk of stress. Ministry of Public Health has been provided "well being" programs for the elderly, and the programs contain mental health care. This is one of potential reasons to explain this tendency. Influence of Buddhism discipline is another anticipatable reason.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

A community based case control study was conducted among women aged 40 years and over in Phutthamonthon District, Nakhon Pathom Province, Thailand during January 15 to February 14, 2004. The study sample size comprised of 115 hypertensive cases and 109 non-hypertensive controls. The main objective of this study was to determine the associations between hypertension and factors related to life style, such as: sodium consumption, physical activity and stress.

Factors related to lifestyle, such as: sodium consumption behavior, pattern of physical activity, and stress management were hypothesized risk factors of this study and were categorized as behavioral factors to examine the associations with hypertension. Physical factors, such as: nutritional and health status (diabetes and high cholesterol); were also the factors related to lifestyle, and were predicted risk factors of hypertension. Socio-demographic characteristics and cognitive and affective variables were regarded as the predisposing factors, supportive relationship and sources of health information were considered as the reinforcing factors, and accessibility of health promotion and screening programs were regarded as the enabling factors, which have associations between hypertension or behavioral factors of hypertension.

The study subjects in the case and control groups are socio- demographically homogeneous. Age and gender were controlled at the stage of data collection. Based on the findings of this study and resulting interpretation, conclusion is as follows:

Among hypothesized behavioral factors: a statistical significance for the association between eating habits of additional salty seasoning use and hypertension was found (p-value = 0.038), while no significant was found for the associations between hypertension and risk food (salty food) consumption behavior, pattern of physical activity and stress management (p-value = 0.520, 0.243, and 0.050, respectively).

Regarding the physical factors, a remarkable significance was found for the association between hypertension and nutritional status. Risk to develop hypertension among the obese was approximately two times higher than the non-obese (OR =2.05, 95%CI = 1.62-3.63). Diabetes was also identified as a risk factor to cause hypertension among the study subjects (OR =2.42, 95%CI = 1.08-5.43).

A statistical significance was not found for the associations between hypertension and cognitive and affective variables (knowledge and perception on hypertension, p-value = 0.392 and 0.704, respectively). Although it was predicted that the cognitive and affective variables affected the behavioral factors, there was not a significant association (with risk food consumption: p-value = 0.710, with eating habits: p-value = 0.792, with physical activity: p-value = 0.740, and with stress management: p-value = .0.262). It was also found that health status, such as diabetes and high cholesterol, did not influence the cognitive and affective variables among the study population.

Summarizing the results, this study determined that the most significant risk factor of hypertension is obesity in Phutthamonthon District, Nakhon Pathom Provice, Thailand. When obesity and diabetes were combined, the risk to develop hypertension becomes remarkably higher (OR =4.10, 95%CI = 1.17-15.72).

Presented statistical significance indicated the risk factors of hypertension in the study area. The determination of the risk factors can be used as baseline data for future health promotion programs. Even without statistical significances for the

associations between predicted risk factors and hypertension, several observational remarks were found to state recommendation for prevention of hypertension in the future in the study area.

6.2 Recommendation

6.2.1 General Recommendation

For the purpose to reduce the prevalence of hypertension in Phutthamonthon District, the following recommendations are made:

1. Hypertension prevention programs should focus on controlling body weight. The prevalence of obesity among the study subjects is much higher than the reported prevalence of obesity in Thailand, and a strong association with hypertension was found in this study. Controlling body weight is the most important issue for further promotion. When obesity and diabetes were combined, the risk to develop hypertension was elevated. Health promotion programs on controlling body weight should be extended especially to diabetes patients.

2. Behavioral modification on eating habits relating to sodium use should focus on reducing the use of additional salty seasoning rather than the frequency of salty foods. Salty food consumption was not a serious risk factor of hypertension in the study area so far, however, rapid changes in social and economic circumstances in Thailand is one of the national issues, including the influx of western lifestyle, in particular, food consumption. For the prevention of hypertension by food consumption change, health education on healthy food should be correctly provided.

3. Blood pressure screening programs should be more easily be accessed by full-time workers. Although most of the study subjects knew their own blood pressure status, they are not really the representatives of all women aged 40 years and over in Phutthamonthon District. Due to their working conditions, the study subjects can rather easily access public health services. Knowing own blood

pressure status is the first step for hypertension prevention and control.

6.2.2 Recommendation for further research

Duration of data collection should be longer for precise data of dietary assessment. For high quality of data, training of interview technique should be provided with demonstrations

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APPENDIX

APPENDIX A
QUESTIONNAIRES

HYPERTENSION AND RISK FACTORS RELATED TO LIFESTYLE AMONG WOMEN AGED 40 YEARS AND OVER IN PHUTHAMONTTHON DISTRICT, THAILAND

Date of registration_____/_____/_____

Registration No._____.

Name:.....Address:.....

BMI: Height..... cm Weight.....kg SBP..... DBP.....

Name of Interviewer:..... Time to begin.....

Part 1 Host Factors Assessment

1. Birthday..... Age ..... years

2. Has medical person ever diagnosed you as hypertension?

   1. Yes 2. No

   If "Yes", are you taking medicine for hypertension?

   1. Yes 2. No

3. Has medical person ever diagnosed you as diseases as follows?
   - 3.1 Diabetes Mellitus 1. Yes 2. No
   - 3.2 Heart Disease 1. Yes 2. No
   - 3.3 High Cholesterol 1. Yes 2. No
   - 3.4 Others Specify _____

4. Do you follow what doctors, nurses, or medical staff told you for hypertension?
   1. Follow
   2. Sometimes not Reasons:.....
   3. Not follow Reasons:.....
   4. I was not told any Reasons:.....
   5. No hypertension

5. What is your occupation?
   1. Farmer
   2. Civil Servant
   3. Professional (teacher, nurse, system engineer)
   4. Owner of small business
   5. Executive in private company
   6. Employee in private company
   7. Housewife
   8. Other: Specify _____

6. What is your husband's occupation?
   1. Farmer
   2. Civil Servant
   3. Professional (teacher, nurse, system engineer)
   4. Owner of small business
   5. Executive in private company
   6. Employee in private company
   7. No occupation
   8. Other: Specify _____

7. Education background

1. No schooling 2. 1-6 years schooling (primary)
3. 7-12 years schooling (secondary) 4. >12 years

8. Is anyone in your family hypertensive?

1. Parents 2. Father 3. Mother 4. Brothers or Sisters
5. Children 6. No one 7. Don't know

9. Please answer the questions below.

Question	Answer		
	Yes	No	Don't know
1. Hypertension is a preventable disease.			
2. If both of my parents are hypertensive, I can not avoid developing hypertension.			
3. There is association between salty food and hypertension.			
4. There is relationship between hypertension and obesity.			
5. Hypertension will cause heart diseases.			
6. Adequate exercise can lower blood pressure.			
7. Meditation can lower blood pressure.			
8. Recreation can lower blood pressure.			

Please answer the questions below

Question	Answer		
	Agree	Not agree	Not sure
1. I don't want to be fat because it doesn't look nice.			
2. Woman should be a little fat: otherwise it looks unhealthy or shabby.			
3. Hypertension is very serious disease.			
4. Hypertension doesn't really matter because medicine can control it			
5. Feeling satisfied with your life can prevent you from hypertension.			
6. Since eating is my best pleasure of life, it is difficult for me to modify my diet to control blood pressure.			
7. I should check my blood pressure at least once a year even though I have no symptom of hypertension.			

Part 2 Environment Factors Assessment

10. Who are the persons you often talk with about any health related issue?
(Multiple choice)

1. Family 2. Friends 3. Health Staff
4. No one 5. Others: Specify _____

11. Do you get any health-related information from things or persons below?
(Multiple choice)

1. Books, Magazines or newspaper
2. Brochure or pamphlet from hospital or Health Center
3. Health promotion program conducted by Health Center
4. TV or radio
5. Family member or friends
6. Have learned since been a student
7. No information
8. Others: Specify _____

12. Is there any information related to health available close to your house?

1. Yes ( )
2. Never

13. Did you join health promotion programs provided by Health Center last year?

1. Yes, I joined both health promotion and health screening programs.
2. Yes, I joined health promotion program.
3. Yes, I joined health-screening program.
4. No, I did not join any.

14. How did you know about the programs?

1. Health staff came to my house 2. From Village Health Volunteer
3. By brochure 4. From Leader in the community
5. Neighbors 6. Others: Specify _____

15. The reason why you did not join the programs.

(Multiple choice)

1. Because I did not know about the programs.
2. Because I was busy with my work, and could not find time to join the programs.
3. Because my house is located far from access to the programs.
4. Because I was fully healthy so that I did not need to join such programs.
5. Others: Specify _____

Part 3 Agent Factors Assessment

What kind of food do you prefer?

Food	Sweet/ Fruit
1.	1.
2.	2.
3.	3.

What kind of food do you often eat?

1) .....

2) .....

3) .....

16. Salty food frequency

How often do you eat food as follows?

Food	Frequency			
	times / day	times / week	times / month	Not eat
1. Spicy hot food (includes curry)				
2. Noodles				
3. Instant noodle				
4. Salted fish				
5. Salted egg				
6. Salted meat (pork, beef, chicken and duck)				
7. Processed food (sausage and fish-balls)				
8. Bread/ cracker with butter or cheese				
9. Caned fish or meat				
10. Pickle				

17. Eating habits

17.1 How many spoons (tea spoon) of the following items do you add when you eat following food?

Type of Food	Fish Sauce	Nam Phrik	Other Sauce	Sugar	Vineger	Chili	Other
1. Noodle							
2. White Spaghetti							
3. One-plate dish							
4. Soup							
5. Fried vegetables							
6. Fried fish or chicken							
7. Fried egg (Omelet)							
8. Boiled vegetables							

17.2 Do you add sauce before you taste food?

1. Yes 2. No

17.3 Do you finish all soup when you eat noodle?

1. Yes 2. No

17.4 Why do you add fish sauce?

1. Prefer salty taste
2. Used to it
3. Getting older made me take more salty food
4. After tasting food, it is bland
5. Others: Specify _____

18. What are your physical activities, how often a week and how long per day?

Type of physical activities	Frequency	Duration
2. Domestic duties: (inside of house, such as cooking, cleaning and doing laundry)	days / week	hours minutes
2. Farming or gardening	days / week	hours minutes
3. Working		
3. Watching TV	days / week	hours minutes
4. Chatting with friends	days / week	hours minutes
5. Sports: (such as volleyball, aerobics, swimming and so on)	days / week	hours minutes
6. Others: Specify _____ _____	days / week	hours minutes
7. Others: Specify _____ _____	days / week	hours minutes

19. How often do you have the following symptoms, behavior or feeling?

Question	Answer			
	Never	Some-times	Often	Always
1. Not able to sleep because of anxiety?				
2. Feeling irritated?				
3. Cannot do anything because of neurotension?				
4. Worried?				
5. Don't want to meet people?				
6. Having migraine or headache at both temples?				
7. Feeling unhappy and sad?				
8. Feeling hopeless in life?				
9. Feeling like my life is worthless?				
10. Constantly perturbed?				
11. Feeling out of focus?				
12. Feeling too exhausted to do anything?				
13. Feeling too bored to do anything?				
14. Have palpitation of the heart?				
15. Tremor of voice, lips or hands when frustrated?				
16. Feeling afraid of making mistakes?				
17. Having myofascial pain at back, neck, or shoulder?				
18. Easily nervous in unfamiliar situation?				
19. Dizziness?				
20. Having less sexual pleasure?				

20. What are your stress management?
(Multiple choice)

1. Sports.
2. Chatting with friends
3. Shopping
4. Eating
5. Thai-massage
6. Listening to music
7. Something related to religion
8. Nothing special
9. Taking an afternoon nap
10. Others: Specify _____

APPENDIX B

Additional Distribution Tables

Table 34 Percentage of correct answer for the knowledge assessment on hypertension

Questions	Correct Answer	
	n	%
1. Hypertension is a preventable disease. (Yes)	185	(82.6)
2. If both of my parents are hypertensive, I can not avoid developing hypertension. (No)	110	(49.1)
3. There is association between salty food and hypertension. (Yes)	144	(64.3)
4. There is relationship between hypertension and obesity. (Yes)	115	(51.3)
5. Hypertension will cause heart diseases. (Yes)	142	(63.4)
6. Adequate exercise can lower blood pressure. (Yes)	186	(83.0)
7. Meditation can lower blood pressure. (Yes)	166	(74.1)
8. Recreation can lower blood pressure. (Yes)	202	(90.6)

Table 35 Frequency and percentage distribution of correct answer of the knowledge assessment on hypertension in case and control

Questions	Case		Control	
	n	%	n	%
1. Hypertension is a preventable disease. (Yes)	93	(80.9)	92	(84.4)
2. If both of my parents are hypertensive, I can not avoid developing hypertension. (No)	49	(42.6)	61	(56.0)
3. There is association between salty food and hypertension. (Yes)	79	(68.7)	65	(59.6)
4. There is relationship between hypertension and obesity. (Yes)	63	(54.8)	52	(47.7)
5. Hypertension will cause heart diseases. (Yes)	66	(57.4)	76	(69.7)
6. Adequate exercise can lower blood pressure. (Yes)	97	(84.4)	89	(81.7)
7. Meditation can lower blood pressure. (Yes)	84	(73.0)	82	(75.2)
8. Recreation can lower blood pressure. (Yes)	103	(90.4)	99	(90.6)

Table 36 Distributions of positive perception on hypertension in case and control

Questions	Case		Control	
	n=115	%	n=109	%
1. Hypertension is very serious disease. *(Agree)*	89	77.4	71	65.1
2. Hypertension doesn't really matter because medicine can control it. *(Disagree)*	15	13.0	13	11.9
3. Feeling satisfied with your life can prevent you from hypertension. *(Agree)*	72	62.6	69	63.3
4. Since eating is my best pleasure of life, it is difficult for me to modify my diet to control blood pressure. *(Disagree)*	4	3.5	9	8.3
5. I should check my blood pressure at least once a year even though I have no symptom of hypertension. *(Disagree)*	85	73.9	99	90.8

Table 37 Mean score distribution of each question in the stress assessment

Questions	Score mean	
	Case	Control
1. Not able to sleep because of anxiety? *(Physical symptom)*	1.3	1.0
2. Feeling irritated? *(Emotional symptom)*	1.2	1.1
3. Cannot do anything because of neurotension? *(Mental symptom)*	0.7	0.6
4. Worried? *(Emotional symptom)*	0.9	0.7
5. Don't want to meet people? *(Mental symptom)*	0.5	0.4
6. Having migraine or headache at both temples? *(Physical symptom)*	0.9	0.9
7. Feeling unhappy and sad? *(Emotional symptom)*	0.6	0.5
8. Feeling hopeless in life? *(Emotional symptom)*		
9. Feeling like my life is worthless? *(Mental symptom)*	0.5	0.3
10. Constantly perturbed? *(Physical symptom)*	0.5	0.4
11. Feeling out of focus? *(Mental symptom)*	0.5	0.5
12. Feeling too exhausted to do anything? *(Emotional symptom)*	0.7	0.7
13. Feeling too bored to do anything? *(Emotional symptom)*	0.7	0.7
14. Have palpitation of the heart? *(Physical symptom)*	0.7	0.6
15. Tremor of voice, lips or hands when frustrated? *(Physical symptom)*	0.8	0.4
16. Feeling afraid of making mistakes? *(Mental symptom)*	0.5	0.6
17. Having myofascial pain at back, neck, or shoulder? *(Physical symptom)*	0.9	0.7
18. Easily nervous in unfamiliar situation? *(Mental symptom)*	0.8	0.7
19. Dizziness? *(Physical symptom)*	1.1	1.0
20. Having less sexual pleasure? *(Physical symptom)*	0.3	0.4

Table 38 Score distribution of the stress assessment in case and control by age range

Interval score of risk food assessment	**Case**				**Control**			
	45-54 yr		55-64 yr		45-54 yr		55-64 yr	
	n=63	(%)	n=52	(%)	n=68	(%)	n=41	(%)
<60	48	(76.2)	36	(69.2)	48	(70.6)	36	(87.8)
>60-80	9	(14.3)	7	(13.5)	11	(16.2)	3	(07.3)
>80-100	3	(04.8)	5	(09.6)	5	(07.4)	1	(02.4)
>100	3	(04.8)	4	(07.7)	4	(05.9)	1	(02.4)

Table 39 Frequency distribution of eating noodles in case and control

Frequency of	**Case**		**Control**		χ^2	**P-value**
eating noodles	n=114	(%)	n=108	(%)		
<2.0	50	(43.9)	41	(38.0)	7.52	0.508
2.0-<4.0	11	(09.7)	9	(08.3)		
4.0-<6.0	11	(09.7)	11	(10.2)		
6.0-<8.0	2	(01.8)	4	(03.7)		
8.0-<10.0	5	(04.4)	6	(05.6)		
10.0-<12.0	1	(00.9)	6	(05.6)		
12.0-<14.0	4	(03.5)	8	(07.4)		
>14.0	30	(26.3)	23	(21.3)		
Median	2		4			

APPENDIX C

FOOD PREFERENCE AMONG THE STUDY SUBJECTS

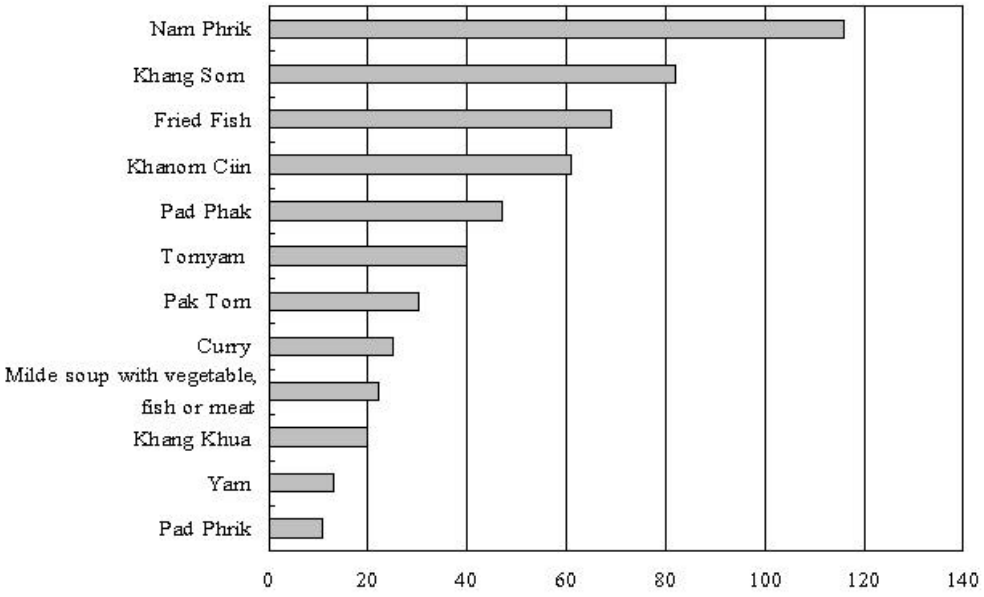

Figure 12: Food preference among the study subjects

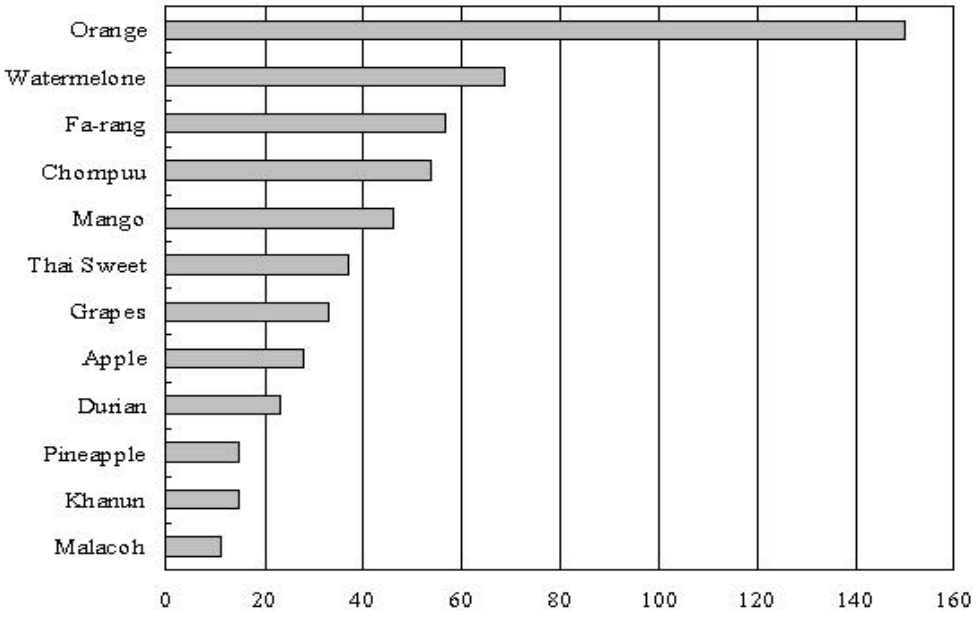

Figure 13: Food preference (fruits and sweets) among the study subjects

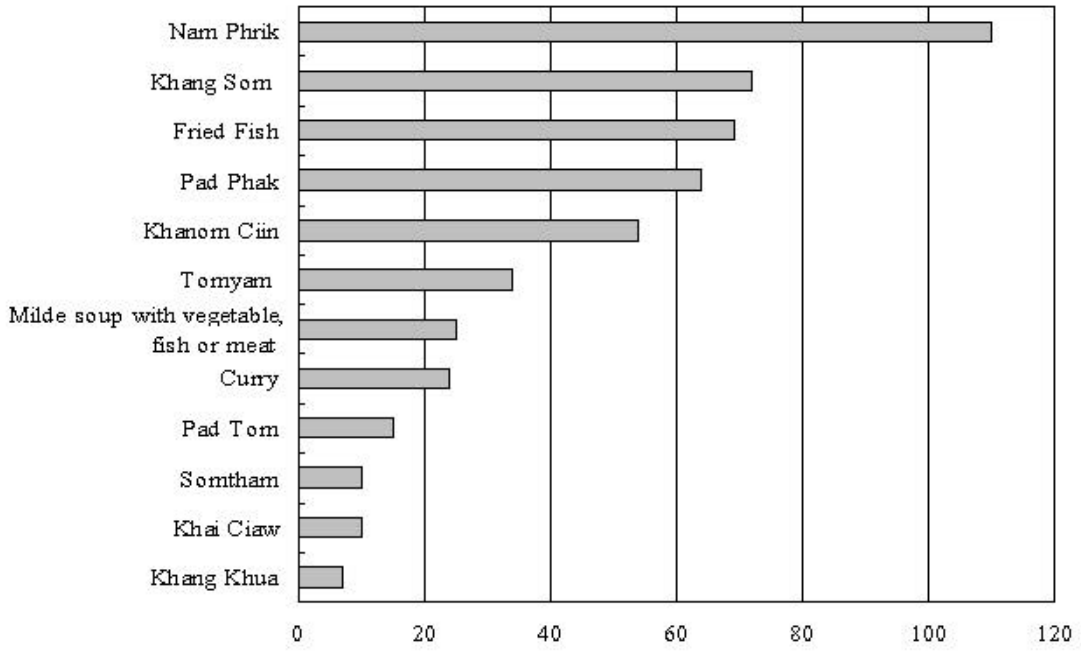

Figure 14: Foods eaten frequently among the study subjects

BIOGRAPHY

NAME	Kaori Mizumoto
DATE OF BIRTH	January 30, 1966
PLACE OF BIRTH	Shimane, Japan
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