DEVELOPMENT OF MULTIMEDIA WEBSITE NUTRITION EDUCATIONAL TOOL FOR MEAL PLANNING IN HYPERTENSIVE SUBJECTS

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DEVELOPMENT OF MULTIMEDIA WEBSITE NUTRITION EDUCATION TOOL FOR MEAL PLANNING IN HYPERTENSIVE SUBJECTS

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ABSTRACT

High blood pressure is a common health problem in both developed and developing countries. To control hypertension, efforts to reduce the prevalence of hypertension in the early stage have focused on non-pharmacologic approaches that lower blood pressure. An educational website is a tool that provides knowledge to people, offers privacy, 24-hour availability, and individual learning as well as benefits to large numbers of subjects at a low cost. The purposes of the study were to develop and evaluate the effectiveness of a multimedia website nutrition education tool (www.kindee-jaidee.com) for meal planning in hypertensive subjects, based on the concepts of the Dietary Approach to Stop Hypertension (DASH diet) and the sodium traffic light. The content consists of self-assessment application programs, video media of hypertension knowledge, information about hypertension, knowledge of nutrition and exercise for hypertension control, food photo gallery, and web-board. The effectiveness of the multimedia website was evaluated by 38 pre-hypertensive and hypertensive subjects (21 males and 17 female) aged 49.71 ± 6.82 years. All subjects were assigned to self-learning via the developed multimedia website for 4 weeks. Subjects were assessed on their knowledge, attitude toward hypertension awareness and management before and after using the multimedia website. Baseline blood pressure, anthropometric data, and dietary intake were also determined.

The results of the study show that most subjects were obese with a mean BMI of 27.85±5.84 kg/m^2 and waist circumference, percentage of body fat including visceral fat were higher than the normal criteria. The mean energy intake was 1,752.39 ± 223.77 kcal per day and the proportion of carbohydrate, protein, and fat was 60.36 : 12.57 : 27.08 percent of kcal. The mean dietary fiber, potassium, and calcium intake were lower than the recommended values. Whereas the mean sodium and cholesterol intake were higher than the recommended values. The knowledge score of subjects at the end of the study was significantly improved ($p<0.001$), compared to the baseline. Most subjects had improved their knowledge level from low and moderate levels (44.7% and 42.11%) to moderate and high (50% and 42.11%) levels. Most subjects had a significant improvement of attitude on hypertension awareness and management ($p<0.05$), and 81.6% of subjects had a good attitude level. Subjects accessing the website were recorded, and the results indicated that subjects who accessed the website more than 3 times a week had a moderate to high level of knowledge; whereas subjects who accessed the website less than 3 times a week had a low to moderate level of knowledge. In total, the aspects of the developed tool were found to be satisfactory.

In conclusion, the developed multimedia website nutrition education tool is acceptable as an attractive learning tool for pre-hypertensive and hypertensive persons, and helps to improve knowledge of hypertension and nutrition as well as attitude on hypertension awareness and management.

KEY WORDS: HYPERTENSION/ MULTIMEDIA WEBSITE/ NUTRITION EDUCATION

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การพัฒนาเครื่องมือสื่อการสอนทางโภชนาการผ่านระบบมัลติมีเดียเว็บไซต์ สำหรับการวางแผนการบริโภคอาหารในผู้ที่มีความดันโลหิตสูง

DEVELOPMENT OF MULTIMEDIA WEBSITE NUTRITION EDUCATION TOOL FOR MEAL PLANNING IN HYPERTENSIVE SUBJECTS

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บทคัดย่อ

โรคความดันโลหิตสูง เป็นปัญหาสุขภาพทั้งในประเทศที่กำลังพัฒนาและประเทศที่พัฒนาแล้ว เพื่อที่ จะควบคุม และลดอุบัติการณ์โรคความดันโลหิตสูง การให้ความรู้ผ่านทางเว็บไซต์ เป็นวิธีการหนึ่งที่จะเผยแพร่ความรู้แก่ประชาชน มีความเป็นส่วน ตัว ใช้งานได้ 24 ชั่วโมง และเป็นการเรียนรู้เป็นรายบุคคล ตลอดจนได้ประโยชน์แก่บุคคลกลุ่มใหญ่โดยไม่สิ้นเปลืองค่าใช้จ่าย

วัตถุประสงค์ในการศึกษานี้พัฒนาและประเมินประสิทธิผลของเครื่องมือสื่อการสอนทางโภชนาการผ่านระบบมัลติมีเดียเว็บไซต์ (www.kindee-jaidee.com) สำหรับการวางแผนการบริโภคอาหารในผู้ที่มีความดันโลหิตสูง โดย นำแนวคิดในการบริโภคอาการแบบแดช ไดเอ็ท และแนวคิดสัญญาณไฟจราจรของโซเดียมมาใช้ในมัลติมีเดียเว็บไซต์ที่ได้ทำการพัฒนาขึ้น โดยเนื้อหาภายในเว็บไซต์ประกอบด้วย โปรแกรมสำหรับการประเมินตนเอง สื่อวีดีโอความรู้เรื่องโรคความดันโลหิตสูง ความรู้เรื่องโภชนาการและการออกกำลังกาย ห้องแสดงภาพอาหารและข้อมูลของอาหาร รวมถึงเว็บบอร์ด ประสิทธิผลของเครื่องมือได้ศึกษาในผู้ที่มีความเสี่ยงต่อการเกิดความดันโลหิตสูงและผู้ที่มีความดันโลหิตสูง ผ่านมัลติมีเดียเว็บไซต์ที่พัฒนาขึ้น ทั้งหมด 38 คน (ชาย 21 คน หญิง 17 คน) อายุเฉลี่ย 49.71 ± 6.82 ปี ผู้เข้าร่วมในการศึกษาวิจัย ได้รับมอบหมายให้เรียนรู้ด้วยตนเองเป็นระยะ เวลา 4 สัปดาห์ ผู้เข้าร่วมจะได้รับการประเมินในส่วนของความรู้ ทัศนคติในการตระหนัก และการ จัดการโรคความดันโลหิตสูง ทั้งก่อนและหลังการเรียนรู้จากมัลติมีเดียเว็บไซต์ รวมทั้งศึกษาข้อมูลเบื้องต้นของความดันโลหิต สัดส่วนร่างกาย และการบริโภคอาหารของผู้เข้าร่วมวิจัย

ผลการศึกษาพบว่า ผู้เข้าร่วมโครงการส่วนใหญ่อยู่ในเกณฑ์ที่อ้วน โดยมีค่าเฉลี่ยของดัชนีมวลกายอยู่ที่ 27.85±5.84 kg/m^2 ในขณะที่เส้นรอบพุง เปอร์เซนต์ไขมันใต้ผิวหนัง รวมถึงระดับไขมันหน้าท้องอยู่ในระดับที่สูงกว่าปกติ สำหรับค่าเฉลี่ยของพลังงานที่ได้รับจากอาหารอยู่ที่ 1,752.39 ± 223.77 กิโลแคลอรี่ ต่อวัน โดยมีเปอร์เซนต์สัดส่วนการกระจายพลังงานต่อวันของคาร์โบไฮเดรต โปรตีน และไขมัน คือ 60.36 : 12.57 : 27.08 ค่าเฉลี่ยของปริมาณใยอาหาร โพแทสเซียม และแคลเซียม พบว่ามี ค่าต่ำกว่าปริมาณที่แนะนำ ในขณะที่ค่าเฉลี่ยของโซเดียม และคอเลสเทอรอล มีค่าสูงกว่าปริมาณที่แนะนำ คะแนนความรู้หลังจากสิ้นสุดการศึกษา พบว่าผู้เข้าร่วม มีคะแนนความรู้ดีขึ้นอย่างมีนัยสำคัญ ($p<0.001$) เมื่อเทียบกับคะแนนพื้นฐานที่ทำการประเมินก่อนการศึกษา ผู้เข้าร่วมส่วนใหญ่มีระดับความความรู้ที่ดีขึ้นจากมีความรู้น้อยถึงปานกลาง (44.7% และ 42.11%) เป็น มีความรู้ระดับปานกลางถึงมาก (50% และ 42.11%) ในส่วนของทัศนคติพบว่า ผู้เข้าร่วม วิจัย ส่วน ใหญ่ มีทัศนะคติที่ดีขึ้น ($p<0.05$) และ 81.6% ของผู้เข้าร่วม วิจัย มีทัศนคติอยู่ในเกณฑ์ที่ดี ผลการเข้าใช้งานเว็บไซต์ของผู้เข้าร่วมโครงการพบว่าในผู้ที่เข้าใช้เว็บไซต์มากกว่า 3 ครั้ง ต่อสัปดาห์ มีคะแนนความรู้ในระดับปานกลางถึงสูง ในขณะที่ผู้เข้าใช้เว็บไซต์น้อยกว่า 3 ครั้ง ต่อสัปดาห์ มีระดับความรู้ที่น้อยถึงปานกลาง การประเมินความพึงพอใจของผู้ใช้เว็บไซต์พบว่าอยู่ในเกณฑ์ที่ดี

ผลการศึกษานี้สรุปได้ว่า เครื่องมือสื่อการสอนทางโภชนาการผ่านระบบมัลติมีเดียเว็บไซต์ สำหรับการวางแผนการบริโภคอาหารในผู้ที่มีความดันโลหิตสูงที่พัฒนาขึ้น เป็นที่ยอมรับว่าเป็นเครื่องมือให้ความรู้ที่น่าสนใจ และช่วยให้มีความรู้เพิ่มขึ้นในเรื่องของโรคความดันโลหิตสูงและการวางแผนการกินอาหาร ตลอดจนทัศนคติในการตระหนักรับรู้และการจัดการ โรคความดันโลหิตตสูงดีขึ้น

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CHAPTER I
INTRODUCTION

Background and rationale of the study

High blood pressure or hypertension is a world health problem in both developing and developed countries. The estimate prevalence of hypertension may reach 1 billion people a year [1]. It is a majority risk factor of target organ damage (TOD) such as left ventricular hypertrophy, prior myocardial infarction, heart failure, stroke, chronic kidney disease and lead to a disability [2,3]. Data from the National Health and Nutrition Examination Survey (NHANES III) revealed that 29% of U.S. adults aged 18 years and older had hypertension [4].

The published report in 2003-2004 by Ministry of public health Thailand reported that hypertension is a third cause of death in Thais [5] and the ratio of morbidity and mortality is at 398.4 and 5.4 per 100,000 populations respectively. The prevalence of Thai hypertensive population is at 35.82%. However, the numbers of people who are not diagnosed as hypertension have reached to 71.4% of Thais population. These are associated with the increasing of cardiovascular disease [6,7].

The relationship between hypertension and risk of coronary artery disease are continuous and consistent including other risk factors [8]. Prevention and control in the early stage of hypertension can reduce its complications, reduce medical expense and make patient's good quality of life. At the present, hypertension management in the early stage focus on non-hypertensive drug in the early stage, therefore, provision of nutrition knowledge along with lifestyle modification is the most important baseline treatment for both prevention and control hypertension.

According to the JNC seventh guideline [9] for prevention assessment and treatment of hypertension, the recommendation of lifestyle modifications are weight control, reduce sodium intake, reduce alcohol, increase potassium intake and engage in regular aerobic physical activity. A lifestyle change is needed to prevent and control

hypertension weight reduction at least 4.5 kilograms can reduce blood pressure [10,12]. The clinical trial study by Appel et al [13] on dietary management and control hypertension using diet model called "Dietary Approach to Stop Hypertension" or DASH diet which consist of vegetable, fruits, low-fat milk product, low-fat meat and nuts. These foods contain potassium and calcium as well as low cholesterol, saturated fat and total fat. The study found that DASH diet can reduce systolic blood pressure 11.4 mmHg. and diastolic blood pressure 5 mmHg. in normal people while hypertensive people can reduce systolic and diastolic blood pressure 3.5 mmHg. and 2.1 mmHg. respectively. In addition, dietary sodium should be no more than 100 mmol or 2,400 mg of sodium per day [15]. The study of DASH-sodium trial revealed that people consume diets with 1.5 g. sodium per day had greater blood pressure benefits than those with higher intakes. Thus, an appropriate intake level of sodium has been set at 1.5 g/day [13,14]. Furthermore, the study of Frank et al [16] found that consumed DASH diet with sodium restriction can lower blood pressure better than either DASH diet or sodium restriction alone.

In 2006, Janejob N [17] has studied and developed a handbook for meal planning to control sodium intake by using traffic-light concept to be a representative of the amount of sodium in food per serving and the result revealed that majority of participants improved their knowledge of dietary sodium to control hypertension. Moreover, there are no relationships between knowledge levels and age, gender, as well as education after learning the developed tool. Therefore, this developed tool can be applied to use in a daily life.

Nowadays, an electronic system or World Wide Web is a source of health information which users can use to search online about news, knowledge and information. In 2003, the Pew Internet and American Life Project has reported that 63% of American people use the internet online and found that 80% of internet users searching for health information [18] and more than a half searching about diet and nutrition [19]. Moreover, physicians, dietitians and health care provider also search for diet and nutrition information. The survey of Carney et al in 2004 [20] reported that three quarter of physicians used internet for work and 98% or almost all used internet at least once a week. Furthermore, The Canadian Medical Association reported 66% of Canadian physicians used internet to support a treatment, search for

medical data [21]. Physicians, dietitians, or health care provider could provide a better result for advising food and nutrition information, compare important evident data base, and update nutrition information.

In Thailand, a survey of information technology and communication within the household in 2006 reported that 59.51 million people aged over 6 years old, more than 15.39 million people (25.9%) can use computer and 8.47 million people (14.2%) have internet access [22]. Especially among those who use the internet, the majority were found in Bangkok. The uses of computer and Internet are various. It provide good results when used for food and nutrition education [23-25] as well as those who are self-learning in adult group to seek information and get troubleshooting skills to help themselves [26]. In addition, learning through computer and internet has also provided other benefits such as availability 24 hours a day, privacy, and finding the answer of food and nutrition problems as well as other health problems [27,28].

Provision of nutrition knowledge to prevent and control of hypertension is important both in normal and hypertensive people. An education tool is a central media to help a physician, dietitian and health care provider to provide knowledge to people. In Thailand, they have been many education tools which provided knowledge, information and guideline to control hypertension. However, an education tool especially a multimedia website which focuses on dietary management, appropriate food portion size using concept of DASH diet including sodium restriction is limited.

Therefore, this study is designed to develop a multimedia website nutrition education tool to provide food and nutrition knowledge for those who have hypertension or pre-hypertension by using concept DASH diet and applied booklet for sodium content in Thai food for meal planning [17]. This would be beneficial in providing basic knowledge, self-meal planning and assess food intake to control their blood pressure. In addition, physician, dietitian and health care provider can also apply the developed tool to educate patient with hypertension as well as follow up through the website.

CHAPTER II
OBJECTIVES

General objective

To develop multimedia website nutrition education tool for meal planning in pre-hypertensive and hypertensive subjects

Specific objectives

1. To construct a nutrition education tool via multimedia website for providing general information and meal planning guideline in pre-hypertensive and hypertensive subjects.
2. To assess the subject's knowledge and understanding of meal planning using the concept of DASH diet and sodium content in foods via the developed multimedia website education tool.
3. To assess the subject's attitude on hypertension awareness and management
4. To assess the subject's overall satisfaction with the developed multimedia website education tool.
5. To assess the baseline anthropometric parameter and dietary intake.

Research hypothesis

The developed multimedia website nutrition education tool can improve pre-hypertensive and hypertensive subject's knowledge and understanding for meal planning.

Expect benefits

The expected outcomes of the study are as follows:

1. To introduce a new multimedia website nutrition education tool for meal planning in subjects with hypertension.
2. Subjects can apply their knowledge to prevent and control blood pressure to reducing the health care expense and the risk of hypertensive complications.
3. A team approach by physicians, dietitians and health care providers can further apply this multimedia website tool to educate hypertensive patients.
4. The multimedia website can be a useful guideline and reference reliable resource for healthy eating to prevent hypertension in general.
5. To be a guideline for developing other educational tool via multimedia website based on medical nutrition therapy.

Scope of the study

This study developed nutrition education multimedia website tool for meal planning in pre-hypertensive and hypertensive subjects. The study aimed to focus on subject's knowledge and understanding of DASH diet concept and sodium content in foods on meal planning after self-learning via the developed nutrition education multimedia website tool. The evaluation of the effectiveness of the tool was performed in adult subjects aged between 20 to 60 years old.

CHAPTER III
LITERATURE REVIEW

The aim of this study is to develop a nutrition education tool via multimedia website for meal planning in hypertensive subjects. Related theories, concepts, and researches have been studies as described below:

1. Knowledge on Hypertension
2. Treatment of Hypertension
3. Nutrition Education for patients
4. Booklet for sodium content guideline in Thai foods, traffic light concept
5. The Multimedia
6. Web-Based Instruction

1. Knowledge on Hypertension

1.1 Definition of Hypertension

A general definition of hypertension is persistently high arterial blood pressure, the force exerted per unit area on the walls of arteries. To be defined as hypertension, the systolic blood pressure (SBP), the blood pressure during the contraction phase of the cardiac cycle, has to be 140 mmHg. or higher; or the diastolic blood pressure (DBP), the pressure during the relaxation phase of the cardiac cycle, has to be 90 mm Hg. or higher, and they are reported as 140/90 mmHg. The normotensive individual has a blood pressure of 120/80 mmHg [36].

1.2 Classification of Hypertension

Causes of hypertension can be categorized into two types. First type of hypertension calls “essential or primary hypertension” (also called idiopathic hypertension) which is the form of hypertension that has no identifiable

cause and it is affecting 95% of hypertensive patients [37]. Although no direct cause has identified itself, there are many associate factors such as genetics, environment and sedentary lifestyle. [38,39]. The other type calls "secondary hypertension" which is the hypertension from specific disorder such as kidney disease, renovascular disease, endocrine diseases, and tumors [43]. It also can be a side effect of many medications [40-42]. In the seventh Report of the Joint National Committee on Prevention, Detection Evaluation, and Treatment of High blood Pressure (JNC VII) has classified blood pressure for adults ages 18 and older based on each two or more office visits in Table 1.

Table 1 Classification of blood pressure for adults ages 18 and older [9]

Blood pressure classification	**Systolic BP (mmHg)**		**Diastolic BP (mmHg)**
Normal	< 120	and	< 80
Pre-hypertension	120-139	or	80-89
Stage 1 hypertension	140-159	or	90-99
Stage 2 hypertension	> 160	or	> 90

1.3 Pathophysiology of hypertension

Blood Pressure is the force of the blood pushing against the walls of the arteries blood vessel. The product of blood pressure is the function of cardiac output; C.O. multiplied by total peripheral resistance; TPR (the resistance in the blood vessels to the flow of blood) [43]. This reveals that individual blood pressure has relationship to cardiac output and peripheral resistance as shown in Figure 1, the Pathophysiology of hypertension is the consequence of increased cardiac output and/or peripheral vascular resistance, resulting from the alteration of

sympathetic nervous system (SNS), hormone, renal function, renin-angiotensin system (RAS) and mechanism of the other factors.

Cardiac output is the volume of blood being pumped by the heart, in particular by a ventricle in a minute to live human body. Cardiac output increases if stroke volume and the heart contractility increase. Stroke volume (SV) is the volume of blood pumped from one ventricle of the heart with each beat. It is calculated by subtracting the volume of the blood in the ventricle at the end of a beat (called end-systolic volume) from the volume of blood just prior to the beat (called end-diastolic volume) [44]. Stroke volume increases as the effect of vasoconstriction consequently from high sodium intake and sodium retention of renal. In a stress situation, heart contractility increases and peripheral vascular resistance from deterioration of vessels and other factors such as renin-angiotensin excess, cell membrane alteration, obesity, and hyperthelium derived factors. The autoregulation can be described that with increased CO, more blood flows through the tissue than is required, and the increased flow delivers extra nutrients or removes additional metabolic product; in response, the vessels constrict, decreasing blood flow and returning the balance of supply and demand to normal [43].

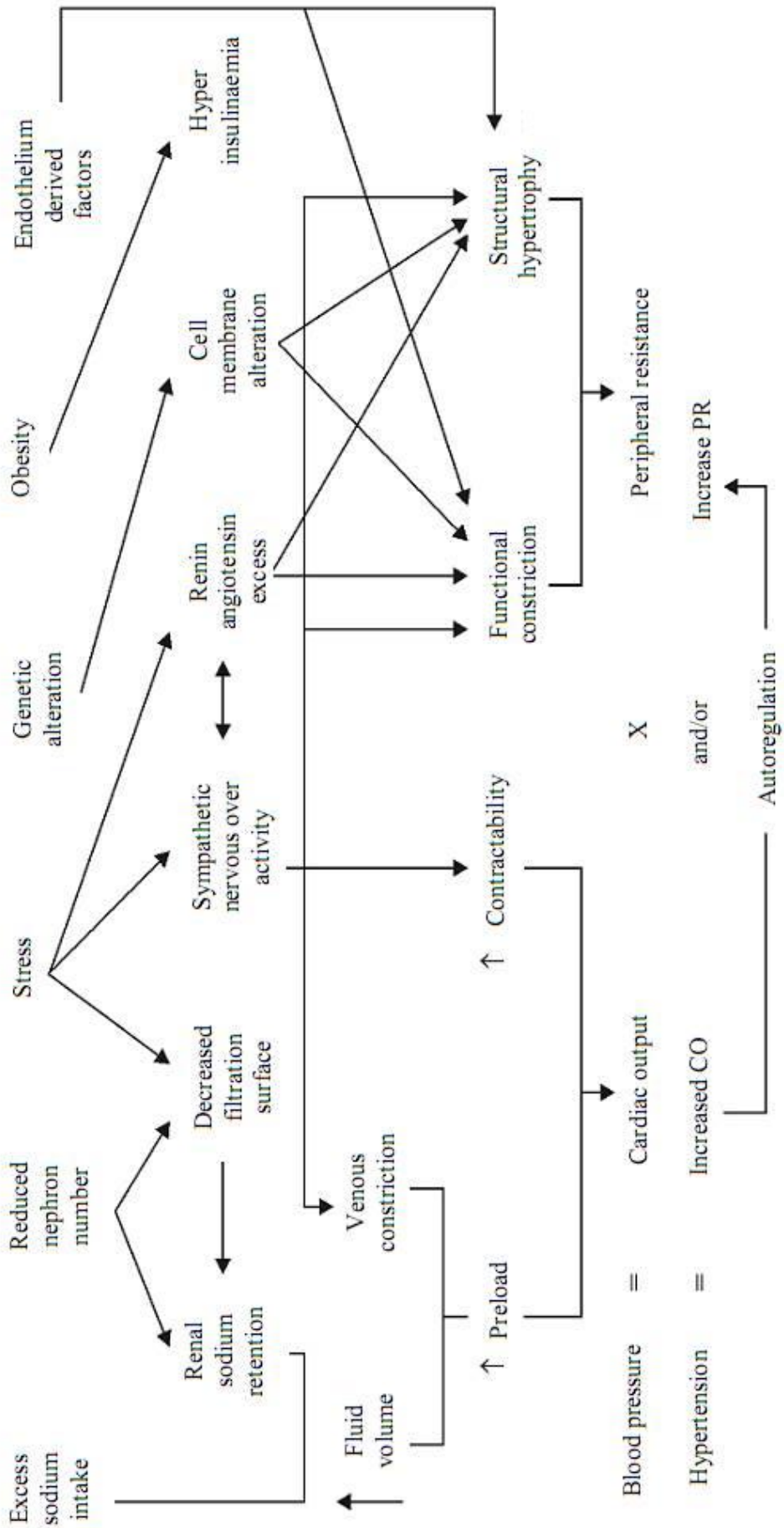

Figure 1 Pathophysiology of hypertension (43)

1.4 Relationship between hypertension and risk of cardiovascular disease

High blood pressure is a modifiable risk factor for cardiovascular disease (CVD) [45]. High blood pressure increases the risk of coronary heart disease (CHD), heart failure, heart attack, stroke, and kidney disease [46-48]. The higher the blood pressure, the greater the chance of target organ damage (TOD) such as heart, brain, kidney as shown in Figure 2.

Major Risk Factors

- Hypertension*
- Age (older than 55 years for men, 65 years for women)†
- Diabetes mellitus*
- Elevated LDL(or total) cholesterol, or low HDL-cholesterol*
- Estimated GFR <60 mL/min
- Family history of premature CVD (men <55 years of age or
- women <65 years of age)
- Microalbuminuria
- Obesity* (BMI >30 kg/m2)
- Physical inactivity
- Tobacco usage, particularly cigarettes

Target Organ Damage

- Heart
  - Left ventricular hypertrophy (LVH)
  - Angina or prior myocardial infarction (MI)
  - Prior coronary revascularization
  - Heart failure
- Brain
  - Stroke or transient ischemic attack
  - Dementia
- CKD
- Peripheral arterial disease
- Retinopathy

* Components of the metabolic syndrome. Reduced HDL and elevated triglycerides are components of the metabolic syndrome. Abdominal obesity also is a component of metabolic syndrome.

† Increased risk begins at approximately 55 and 65 years of age for men and women, respectively. Adult Treatment Panel III used earlier age cut-points to suggest the need for earlier action.

Figure 2 Cardiovascular risk factors [9].

1.5 Factors influencing essential hypertension

The factors influencing to essential hypertension are uncontrollable factors and controllable factors.

1.5.1 Uncontrollable factors

Age

Hypertension risk associate increases with age. It has been estimated that individuals who have normal blood pressure at age 55 still have a 90 percent risk of developing high blood pressure during their lifetimes. However, age-related increase in blood pressure is a typical occurrence in most but not all population [49].

Genetic / Family history

People who have parents or close blood relatives with hypertension are more likely to develop it themselves. Family studies demonstrated the contribution of genetic factors to the development of essential hypertension [50] as well as the studies on natural-adopted children [51,52], and parent-offspring relationships [53-55] are support this definition. Furthermore, genetic factors also influence behavioral patterns which might lead to blood pressure evaluation [56].

Ethnic

Africans-Americans are associated with a higher risk of developing high blood pressure than other ethnic group [57]. It is also more prevalent and severe within certain ethic groups; for example, the prevalence in African-Americans is about 37 percent, compared with rates of approximately 23 percent in both whites Mexican Americans [58].

Gender

Generally men have a greater likelihood of developing high blood pressure than women. This likelihood varies according to age and among various ethnic groups. In all ethnic groups, men tend to have higher mean systolic and diastolic blood pressure than women (by 6-7 and 3-5 mmHg. respectively), and through middle age, the prevalence of hypertension is higher among men than women [59,60].

1.5.2 Controllable factors

Body weight

The occurrence of hypertension rises with increasing body weight [61]. The data from two national surveys were evaluated to determine the relationship between different body mass index (BMI) categories and the prevalence of diabetes mellitus, hypertension and dyslipidaemia from 211,097 adults. It was found that mean BMI was 27.8 kg/m^2 for SHIELD and 27.9 kg/m^2 for NHANES. Increased BMI was associated with increased prevalence of diabetes mellitus, hypertension and dyslipidaemia in both studies [62]. The intervention studies on the effect of intentional weight loss studies reported moderate weight loss (losses 5%-10% of body weight) are associated with significant improvements in obesity related cardiovascular risk factors such as hypertension and diabetes [63].

Physical activity

Less active individuals are 30 to 50% more likely to develop hypertension than their active counterparts. In the Framingham study reported moderate to high levels of physical activity were protective againts developing stroke [64]. Two meta-analyses have demonstrated the beneficial effects of exercise on blood pressure. The first analysis showed that walking reduced blood pressure in adults by an average of 2% [65]. Second, in 54 randomized clinical trials, showed that aerobic exercise reduced blood pressure an average of 4 mmHg for systolic and 2 mmHg for diastolic blood pressure, irrespective of body weight change [66]. Therefore, increasing the amount of physical activity of low to moderate intensity to 30 to 45 minutes most day of the week is an important adjunct to other strategies for the primary prevention of hypertension.

Alcohol consumption

Modest consumption of alcohol (e.g., <30 grams of ethanol a day or approximately two “drinks” daily) is not generally associated with BP increases. Larger amounts of alcohol ingestion have a dose-related effect on blood pressure, both in hypertensive and nor-motensive subjects [10]. Thus, for preventing high blood

pressure, alcohol intake should be less than two drinks per day (24 oz beer, 10 oz wine, or 2 oz 100-proof whisky) in men. In women and lighter weight persons, no more than one drink a day is recommended.

Smoking (Tobacco use)

The study of smoking and blood pressure found that heavy smoking ($\geq$ 20 cigarettes per day) evokes a persistent rise blood pressure after some hours of abstinence from smoking [67]. Moreover, in the treatment of Mild Hypertension Study reported that cigarette smoking was significantly associated with left ventricular hypertrophy as well [68].

Stress

Many factors affecting blood pressure through stress include white coat hypertension, job strain, race, social environment, and emotional distress. Overall, studies show that stress does not directly cause hypertension, but can have an effect on its development. In the study of Tomei F, cited in Dolrat [69] reported that who expose to repeated psychological stressors may have more chance to develop to hypertension than others.

Dietary factors

A person dietary choice may influence hypertension risk. Diet containing generous amounts of fruits, vegetables, nuts, and low-fat milk products can lower blood pressure. These foods provide the major minerals potassium, calcium, and magnesium, which help to reduce blood pressure when include in adequate amounts in the diet. Several dietary patterns have been shown to lower blood pressure. Vegetarian dietary patterns have been associated with lower systolic blood pressure in observational studies and clinical trials.

Dietary approach to stop hypertension (DASH diet)

Average systolic blood pressure reductions of 5 to 6 mm Hg have been reported. Specifically, the Dietary Approaches to Stop Hypertension (DASH) Diet study shows that this low-fatty dietary pattern (including lean meats and nuts while emphasizing fruits, vegetables and, nonfat dairy products) decreased systolic blood

pressure an average of 6 to 11 mmHg and diastolic blood pressure by 3 to 6 mm Hg. The DASH diet is found to be more effective than just adding fruits and vegetables to a low-fat dietary pattern [13].

The Omni Heart Trial examined the effects of three versions of the DASH diet on blood pressure and serum lipids. The diets studies included the original DASH diet, a high-protein version of the DASH diet (25% of energy from protein, about half from plant sources), and a high-unsaturated fat DASH diet (31% of calories from unsaturated fat mostly monounsaturated) Although each diet lowered systolic blood preesure, substituting some of the carbohydrate (approximately 10% of total calories) in the DASH diet with either protein or monounsaturated fat achieved the best reduction in blood pressure and blood cholesterol [69,70]. This could be achieved by substituting some more nuts for some of the fruit, bread, or cereal servings. Due to many hypertensive patients are overweight, hypocaloric versions of the DASH diet have also been tested for efficacy in promoting weight loss and blood pressure reduction. The WELL diet study [71] found that, for the same 5-kg weight loss, a hypocaloric DASH diet versus a low-calorie/low-fat diet produced a greater reduction in systolic and diastolic blood pressure.

Although the DASH diet is safe and currently being advocated by the JNC 7^{th} [9] and the American Heart Association (AHA) for preventing and treating pre-hypertension and hypertension, the diet is high in potassium, phosphorus, and protein, depending on how it is planned. For this reason the DASH diet would not be advisable for individuals with end-stage renal disease [72].

Dietary Sodium Consumption

High sodium intake is positively associated with blood pressure [73]. Evidence from a variety of sources) ie., epidemiologic studies, intervention trials and meta-analyses) support lowering blood pressure by reducing dietary sodium. Large population studies have demonstrated a positive association between dietary sodium intake and blood pressure over a wide range of sodium intakes. Intervention studies such as the Phase 2 of the Trials of Hypertension Prevention (TOHP) have shown that sodium reduction with or without weight loss can reduce the incidence of hypertension by 20 % [74].

Several meta-analyses [75,76] of randomized sodium reduction trials have confirmed positive effects of sodium reduction on blood pressure in both normotensive and hypertensive individuals. A high salt intake has also been implicated in hypertensive target organ disease, including cardiovascular and renal damage [77]. Such data provide the basis for current dietary guidelines for all Americans to limit salt intake to 6g/ day or sodium intake to 2.4 g/day, and for those with hypertension to omit sodium intake to 1.5 g/day [78].

There is heterogenetic in individual responsiveness to sodium. Some persons with hypertension show a greater decrease in their blood pressures in response to reduced sodium intake than others. The term "salt-sensitive hypertension" has been used to identify these individuals. This versus "salt resistant hypertension," which refers to individuals with hypertension whose blood pressures does not change significantly with lowered salt intakes. Current thinking on salt sensitivity is that the relationship between salt and blood pressure is "not binary" [72] Salt-sensitivity has a continuous distribution within diverse populations with individuals having greater or lesser degrees of blood pressure reduction [79]. In general, individuals who are more sensitive to the effects of salt/sodium tend to be individuals who are black, obese, or middle-age and older, or those who have diabetes, chronic kidney disease, or hypertension [80]. Currently there are no practical methods for identifying the salt-sensitive individual from the salt-resistant individual.

Potassium

In observational studies dietary potassium and blood pressures are inversely related (i.e., higher potassium intakes are associated with lower blood pressures). Results from clinical trials on potassium and blood pressure have been less consistent. However, a meta-analysis of these trials found that high dietary potassium may help prevent and control hypertension [81]. On average a median dose of 2.4 g/day of supplemental potassium reduced SBP and DBP by 4.4 and 2.5 mm Hg in hypertensives, and 1.8 and 1 mm Hg in normotensive. The effects of potassium were greater in blacks than whites and in those with higher intake of sodium.

Potassium intake has also been related to stroke mortality. In a large-based cohort, a higher potassium intake was associated with a 38 % lower risk of

stroke [82]. Data from the AHANESS III survey suggests that low dietary potassium intake is associated with an increased risk of stroke [83]. However, more statistically significant effects are found for improved diet, aerobic exercise, alcohol, and sodium restriction, and fish oil supplements than for potassium supplements [84]. The large number of the fruits and vegetables recommended in the DASH diet makes it easy to make dietary potassium recommendations of the JNC 7th and the AHA- approximately 4.7g/day [72]. In individuals with medical conditions that could impair potassium excretion (e.g., chronic renal failure, diabetes, and congestive heart failure), a potassium intake less than 4.7 g/day would be appropriate to prevent hyperkalemia.

Calcium

Higher diary calcium versus nondairy calcium has been associated with a lower incidence of stroke among men and women [82]. These finding s suggest that the effects of calcium may differ, depending on the food source, or alternatively that other constituents of diary may be responsible for the observed associations. Peptides derived from milk proteins, especially fermented milk products, have been shown to function as angiotensin-converting enzymes, thereby lowering blood pressure [85]. At present the JNC 7th report recommends a diet rich in fruits, vegetables, and low-fat products over calcium supplementation for the prevention and management of elevated blood pressure [9]. An intake of dietary calcium to meet the goal of 1,000 to 2,000 mg. daily is recommended.

Magnesium

Magnesium is a potent inhibitor of vascular smooth-muscle contraction and may play a role in blood pressure regulation as a vasodilator. In observational studies dietary magnesium was inversely related to blood pressure [82]. Less consistent findings have been reported from randomized clinical trials of magnesium supplementation for blood pressure control [86]. The DASH dietary pattern emphasizes foods rich in magnesium, including green leafy vegetables, nuts, and whole grain breads and cereals. Overall food sources of magnesium rather than supplemental doses of the nutrient are encouraged to prevent or control hypertension [9].

Lipids

Fewer vegans have hypertension than omnivores, even though their salt intake is not significantly different. The vegans' diets tend to be higher in polyunsaturated fatty acids (PUFAs), among other nutrients, and lower in total fat, saturated fatty acids, and cholesterol. PUFAs are precursors of prostaglandins, whose actions affect renal excretion and relax vascular musculature. Thus an effect on blood pressure is plausible. Both the amount and type of fat have been studied with respect to blood pressure. In several large prospective observational studies and clinical trials, intake of total fat and specific fatty acids had little effect on blood pressure [82]. More recently, studies have shown that supplementation with large doses of fish oil (median dose of 3.7 g/day) can give a modest reduction in systolic and diastolic blood pressure, especially in older hypertensive persons [87]. Side effects of supplementation with fish oil are frequent and include belching, gastrointestinal distress, and halitosis. For this reason and the high dose requirement, fish oils are not routinely recommended as a means of lowering blood pressure [72].

Factors other than dietary fat, such as increase potassium levels, appear to lower blood pressure in vegans. Although dietary lipids do not seem to affect blood pressure, they strongly affect CVD risk, thus the Therapeutic Lifestyle Change diet ie recommended for preventing complication from hypertension and cardiovascular disease. Although fatty acids may not directly blood pressure, an olive oil-enriched diet has been shown to result in a 48 % reduction in need for antihypertensive medication [88]. Soy protein is another that may contribute to the lowing blood pressure [89].

2. Treatment of Hypertension

The goal of hypertension management is to reduce morbidity and mortality from stroke, hypertension-associated heart disease. According to the JNC 7^{th} recommendations, three objectives for evaluating patients with hypertensions are to identify the possible causes, asses the presence or absence of target organs disease and clinical cardiovascular disease, and identify other cardiovascular disease risk factors that will help guide treatment (NIH, 2004). Weight history; leisure-time physical

activity, and assessment of dietary sodium, alcohol, saturated fat, and other patterns (e.g.; intake of fruits, vegetables and diary history. As shown in Table 2, lifestyle changes are primary therapy in all patients with hypertension. However, pharmacologic therapy is necessary in many.

Controlling hypertension can reduce the incidence of heart attack by 20 to 25 percent, heart failure by over 50 percent and stroke by 35 to 40 percent [9]. Usually, both lifestyle modifications and drug therapies and used to treat hypertension. For people with hypertension, changes in diet and lifestyle alone may lower blood pressure to a normal level. In some patients, treatment may focus on systolic blood pressure because it is more important cardiovascular disease risk factor in people over 20 years of age.

Table 2 Hypertension treatment guidelines [90]

Blood Pressure Stage (mmHg)	**Risk group A No risk factor: No evidence of organ damage of CVD**	**Risk group B At Least 1 Risk Factor Not including diabetes: No evidence of organ damage or CVD**	**Risk group C Organ damage or Evidence of CVD and/or diabetes, with or without other risk factors**
High normal	Lifestyle modification	Lifestyle modification	Drug therapy ±*
Stage 1	Lifestyle modification (Up to 12 months)	Lifestyle modification (Up to 12 months)	Drug therapy *
Stage 2	Drug therapy *	Drug therapy *	Drug therapy *

± For those with heart failure, renal insufficiency, or diabetes

* Consider drug as initial therapy plus lifestyle modification

Drug therapies

Most people with hypertension use two or more modifications to meet their blood pressure goals. Using a combination of drugs with different modes of action can reduce the dosages of each drug needed and minimize side effects [91]. Most treatment includes diuretics, which lower blood pressure by reducing blood

volume. Other categories of drugs commonly prescribed include ACE inhibitors, beta-blockers, and calcium channel blockers, which are also used to treat various heart conditions. Drugs dosages may need to be adjusted in follow-up visits until the blood pressure goal reached.

Lifestyle modifications

The main lifestyle modifications recommended for lowering blood pressure include weight reduction of overweight or obese, a diet low in sodium and rich in potassium, calcium and magnesium, regular a physical activity, and a moderate alcohol intake as shown in Table 3. Weight reduction and dietary modification have the most dramatic effects. Combining two or more lifestyle modifications can enhance results substantially.

Table 3 Lifestyle modifications to prevent and manage hypertension [9]

Modifications	**Recommendation**	**Approximate Systolic BP reduction, range**
Weight reduction	Maintain normal body weight (Body mass index 18.5-25.9 kg/m^2)	5-20 mmHg/10 kg. weight loss
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables, and low-fat dietary products with a reduced content of saturated and total fat	8-14 mmHg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol (2.4 g sodium or 6 g sodium chloride)	2-8 mmHg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 minutes per day, most day of the week)	4-9 mmHg
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks per day (e.g. 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) in most men and no more than 1 drink per day in women and higher weight persons	2-4 mmHg

Weight reduction can also reduce blood pressure considerably. In several controlled studies, participants who lost 22 pounds (10 kilograms) lower systolic blood pressure by an average of 74 mmHg, and greater weight loss was associated with greater reductions in blood pressure [92]. The prevalence of hypertension after a year and a half was 20 to 50 percent lower among subjects who lost weight.

Dietary Approaches to Stop Hypertension or DASH eating plan is whole diet approach to blood pressure management was first recommended after a landmark study showed that subjects achieved substantially reductions in blood pressure by

following one of the diet tested [13]. The dietary pattern that proved most successful emphasized fruits, vegetables, and low-fat dietary products and included whole grains, poultry, fish, and nuts. These dietary changes resulted in substantially higher intakes of fiber, potassium, magnesium, and calcium than the standard American dietary pattern that was used as a control diet. The successful DASH pattern, which became known as the "DASH Eating Plan", also limited red meat, sweets, sugar-containing beverages, saturated fat (to 7 percent of total energy per day), and cholesterol (to 150 milligrams per day). During the eight-week period when hypertensive subjects consumed the DASH diet, their systolic blood pressure fell by 11.4 mm Hg more than the blood pressures of subjects who remained on the standard on American control diet. In a subsequent study found that the DASH diet was even more effective when accompanied by lower sodium intakes [16].

Sodium restriction by itself may have modest blood pressure-lowering effect, but some people are more responsive than others. A reduced sodium diet is typically recommended for all people with hypertension, but it should be combined with other lifestyle modifications for greater effect.

3. Nutrition Education for patients

Nutrition education is the process by which people gain knowledge of nutrition and are persuaded to bring about required changes in their food habits. Nutrition education involves teaching the client about the importance of nutrition, providing educational materials that reinforce messages about healthy eating, teaching adolescents skills essential for making dietary change, and providing information on how to sustain behavior change. Moreover, nutrition education is included in a nutrition care plan that patients can learn about the dietary factors that affect a particular medical condition. In addition, education also motivates individuals to make changes in diet and lifestyle that can measurably improve their health status.

A nutrition education program must be tailored to a person's age, level of literacy, and cultural background. Learning style should also be considered. Some people learn best by lecture or discussion and are satisfied with written materials, whereas others prefer visual e.g. such as food models, measuring devices or group discussions. A nutrition session should also assess a person's understanding of the

material and his or her commitment to making the necessary changes. Follow-up sessions can evaluate whether a person has adopted the desired behaviors.

For adults learning, Knowles M.S. [93] has developed andragogy theories (a specific theoretical and practical approach, based on a humanistic conception of self-directed and autonomous learners and teachers as facilitators of learning) as an emerging technology which facilitates the development and implementation of learning activities for adults. This emerging technology is based on five andragogical assumptions of the adult learner:

1. Self-Concept: As a person matures, he or she moves from dependency to self-directness.
2. Experience: Adults draw upon their experiences to aid their learning.
3. Readiness: The learning readiness of adults is closely related to the assumption of new social roles.
4. Orientation: As a person learns new knowledge, he or she wants to apply it immediately in problem solving.
5. Motivation: As a person matures, he or she receives their motivation to learn from internal factors.

4. Booklet for sodium content guideline in Thai foods, traffic light concept

A booklet for sodium content guideline in Thai foods was developed by Janejob N. [17] which purposed for self-help meal planning and sodium restriction. There were 153 food items which presented as a booklet. The booklet consists of 2 parts; the first part was the general knowledge on hypertension, correlation of sodium and blood pressure, sodium in foods and the principle of traffic-light concept. The second part was sodium content in Thai foods per exchange based on food groups.

The concept of self-help meal planning was three colored dots to represent detail for sodium content of food in relevant serving size. The colored dos are as follows:

- The Red dot represents high sodium content which was the foods that contain sodium content between 121-240 milligrams of the sodium that found in an exchange or a serving.
- The Yellow dot represents moderate sodium content which was the foods that contain sodium content between 61-120 milligrams of the sodium that found in an exchange or a serving.
- The Green dot represents low sodium content which were the foods that contain sodium content between 6-60 milligrams of the sodium that found in an exchange or a serving.

The concept of counting sodium colored dots fro meal planning was two green dots equal to one yellow dot. Two yellow dots equal to one red dot and keeping within ten red dots which follow the recommendation of total sodium daily intake for Thais (2,400 milligrams per day) [94].

Figure 3 Booklet for sodium content guideline in Thai foods

5. The Multimedia

The development of multimedia technologies for learning offers new ways in which learning can take place in any places not just only in a classroom. Multimedia is media and content that uses a combination of different content forms. The combination of multimedia are text, audio, still images, animation, video, and interactivity content forms, thus providing a powerful new tool for education.

5.1 Multimedia and Education

In Education, multimedia is used to produce computer-based training courses (CBTs) and reference books like encyclopedia and almanacs. A CBT

lets the user go through a series of presentations, text about a particular topic, and associated illustrations in various information formats. Edutainment is an informal term used to describe combining education with entertainment.

5.2 The Elements of Multimedia in Education [95]

A Multimedia Learning environment involves a number of components or elements in order to enable learning to take place. Hardware and software are only part of the requirement. Multimedia learning integrates five types of media to provide flexibility in expressing the creativity of a learner and in exchanging ideas.

5.2.1 Text

Out of all of the elements, text has the most impact on the quality of the multimedia interaction. Generally, text provides the important information. Text acts as the keystone tying all of the other media elements together. It is well written text that makes a multimedia communication wonderful.

5.2.2 Sound

Sound is used to provide emphasis or highlight a transition from one page to another. Sound synchronized to screen display, enables teachers to present lots of information at once. This approach is used in a variety of ways, all based on visual display of a complex image paired with a spoken explanation (for example, art – pictures are 'glossed' by the voiceover; or math – a proof fills the screen while the spoken explanation plays in the background). Sound used creatively, becomes a stimulus to the imagination; used inappropriately it becomes a hindrance or an annoyance. For instance, a script, some still images and a sound track, allow students to utilize their own power of imagination without being biased and influenced by the inappropriate use of video footage. A great advantage is that the sound file can be stopped and started very easily.

5.2.3 Video

The representation of information by using the visualization capabilities of video can be immediate and powerful. While this is not in doubt, it is the ability to choose how we view, and interact, with the content of digital video that provides new and exciting possibilities for the use of digital video in education. There are many instances where students, studying particular processes, may find themselves faced with a scenario that seems highly complex when conveyed in purely text form, or by the use of diagrams and images. In such situations the representational qualities of video help in placing a theoretical concept into context.

Video can stimulate interest if it is relevant to the rest of the information on the page, and is not 'overdone'. Video can be used to give examples of phenomena or issues referred to in the text. For example, while students are reading notes about a particular issue, a video showing a short clip of the author/teacher emphasizing the key points can be inserted at a key moment; alternatively, the video clips can be used to tell readers what to do next. On the other hand, it is unlikely that video can completely replace the face-to-face lecture: rather, video needs to be used to supplement textual information.

One of the most compelling justifications for video may be its dramatic ability to elicit an emotional response from an individual. Such a reaction can provide a strong motivational incentive to choose and persist in a task. The use of video is appropriate to convey information about environments that can be either dangerous or too costly to consider, or recreate, in real life. For example: video images used to demonstrate particular chemical reactions without exposing students to highly volatile chemicals, or medical education, where real-life situations can be better understood via video.

5.2.4 Animation

Animation is used to show changes in state over time, or to present information slowly to students so they have time to assimilate it in smaller chunks. Animations, when combined with user input, enable students to view different versions of change over time depending on different variables. Animations are primarily used to demonstrate an idea or illustrate a concept. Video is usually taken from life, whereas animations are based on drawings. There are two types of

animation: Cel-based and Object-based. Cel-based animation consists of multiple drawings, each one a little different from the others. When shown in rapid sequence, for example, the operation of an engine's crankshaft, the drawings appear to move. Object based animation (also called slide or path animation) simply moves an object across a screen. The object itself does not change. Students can use object animation to illustrate a point – imagine a battle map of Gettysburg where troop movement is represented by sliding arrows.

5.2.5 Graphics

Graphics provide the most creative possibilities for a learning session. They can be photographs, drawings, graphs from a spreadsheet, pictures from CD-ROM, or something pulled from the Internet. With a scanner, hand-drawn work can be included. Standing commented that, "the capacity of recognition memory for pictures is almost limitless". The reason for this is that images make use of a massive range of cortical skills: color, form, line, dimension, texture, visual rhythm, and especially imagination.

6. Web-Based Instruction

6.1 Definition of Web-based Instruction (WBI)

Web-based Instruction (WBI) is hypermedia-based instructional program which utilizes the attributes and resources of the World Wide Web to create a meaningful learning environment where learning is fostered and supported [96]. Web-based instruction is a new way of teaching popularly adopted at all levels of education. Web-based instruction has the potential for improving the quality of education by supporting the dissemination of skills and knowledge in a holistic approach.

The information explosion has precipitated the rapid incorporation of technology into educational institutions, influencing how teaching and learning are being accomplished. Integrating the internet into distance education changes the information delivery system, impacts instructor and student/learner communication, and creates the challenges. The internet may used in a course that is totally Web-based synchronous (no face-to-face interaction but meets online in real

time), partially Web-based with some face-to-face meetings (plus asynchronous or synchronous interaction), or a traditional class with supplemental Web-based components (e-mail, forums, chat rooms, class content). Web-based Learning (WBI) has been used as synonyms to Web-based Learning (WBL) or Web-based Training (WBT).

The differences between WBI/WBL/WBT are as follows [97]:

1. Web-based Instruction (WBI) is a developing default format for media electronic educational tool via internet-network with a simply format presentation to present content, specialized knowledge through membership services system and all media. Generally use in academic.

2. Web-based Learning (WBL) use for media electronic educational tool via internet-network which developer and learner can be anyone. This focuses on self e-learning.

3. Web-based Training (WBT) is similar to WBI which apply using in organization to developing officer training system.

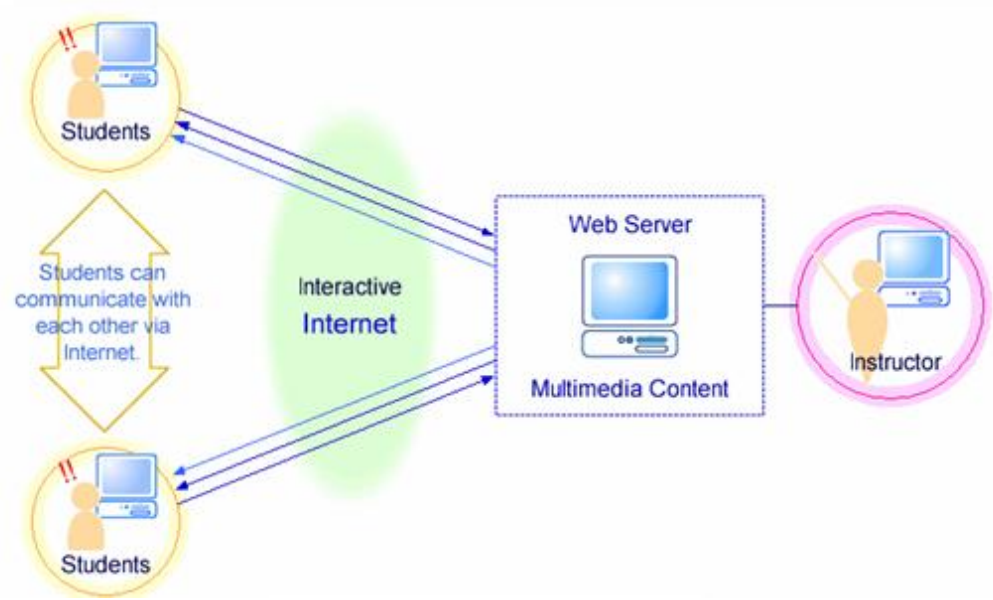

Figure 4 Communication of WBI/WBL/WBT

6.2 Theoretical Rationale of Web-Based Instruction

Web-based instruction is a distance education tool. Emerging with the development of correspondence courses, distance education eventually added videotapes and computer-assisted instruction (CAI) to its repertoire of available tools. Applying internet as an educational delivery system is the newest and most controversial innovation in distance education. Only in the past few years has technology advanced to the point where personal computer memory, modem speed, and bandwidth support Web-based education to most individuals with computer and internet access.

As with any innovation, use of the internet to provide or enhance courses has proponents and detractors. As technology continues to develop at an accelerated pace, many educators are venturing into the unfamiliar, untested territory of Web-based teaching and learning.

6.3 Components of Web-based Instruction

Components, individually and jointly, can contribute to one or more features such as e-mail in a WBI program can provide asynchronous communication to students/learners and the instructor. Various WBI components are clustered into the following general categories as follows:

1. Content Development
    - Learning and instructional theories
    - Instructional design (ID)
    - Curriculum development
2. Multimedia Component
    - Text and graphics
    - Audio streaming (e.g. Real Audio)
    - Video streaming (e.g. Quick Time)
    - Graphic User Interface (GUI) uses icons, graphics, windows and a pointing device, instead of purely character-mode interface (e.g. Microsoft Windows and MacOS are examples of GUIs).
    - Compression technology (e.g. Shock Wave)

3. Internet Tools
    - Communication tools
        - Asynchronous: e-mail, listservs, newsgroups, etc.
        - Synchronous: text-based (e.g. Chat,IRC, MUDs, etc.) and audio-video (e.g. Internet phone, Cu-SeeMe, etc.) conferencing tools.
    - Remote access tools (Logging into and transferring files from remote computers)
    - Internet navigation tools (Access to databases and web documents)
    - Search and other tools (e.g. Search engines, Counter tool.)
4. Computers and Storage Devices
    - Computer platforms running Unix, DOS, Windows and Macintosh operating systems.
    - Servers, hard drives, CD-ROMs, etc.
5. Connections and Service Providers
    - Modems
    - Dial-in and dedicated services
    - Gateway Service Provider, Internet Service Providers, etc.
6. Authoring Programs
    - Programming languages (e.g. HTML – HyperText Markup Language, VRML – Virtual Reality Modeling Language, Java, Java scripting, etc.)
    - Authoring tools (easier to use than programming languages)
    - HTML Converters and Editors, etc.
7. Servers
    - HTTP servers, HTTPD software, Website, URL 0 Uniform Resource Locator, etc.
8. Browsers and Other Applications
    - Text-based browser, graphical browser, VRML browser, etc.
    - Links (e.g. hypertext links, hypermedia links, 3-D links, imagemaps, etc.)
    - Applications that can be added to web browsers such as plug-ins.

6.4 Advantage of Web-based Instruction/Learning

Technology makes a convenience to users/learners. The most obvious advantage of WBL is reducing of distance learning. This enables WBL to facilitate the learning across different sites, different cities, or even different countries [98]. Learners have the opportunity to participate in the same knowledge or/and instruction activities regardless of locations [99]. WBL offers the promise of individualized learning [100]. Learners can control the entire learning environment by allowing them to select various learning opportunities to access to the courses or the knowledge providing in the World Wide Web (WWW) network with a multi platform and easy updates to keep current information. This provides new tools to facilitate better instruction for example, easy to provide a link to source from many websites. Moreover, learners can manage their time and reduce the traveling expenses. Additional, WBL facilitates online assessment and documentation which has flexibility in distance and timing.

At the present, a variety of technologies are being used to deliver education on the internet including the use of the World Wide Web (WWW) for online learning. In 2005, the study of Castro H et al. [144] which compared the efficacy of web-based computer-assisted education (CO-ED) system versus searching the internet for learning about hypertension. It was found that subject age 45 years above who used a web-based computer-assisted education had a statistically significant 15% increase of knowledge score from the baseline knowledge while knowledge scores of subjects searching the internet at "www.yahoo.com" for information about hypertension increased only 0.8%. They suggested that, for older adults, particularly with no internet experience, the web-based computer education was an effective tool for learning about hypertension. Furthermore, it can easily be accessed in convenient locations and it would be a cost effective and clinically effective method for improving hypertension knowledge.

On the effects of the web-based computer education to the subject's eating habits including anthropometric parameters. Thomas J Moore et al [102] had studied in 2,834 subjects by providing weekly articles about healthy nutrition via the internet. The dietary advice was based on the DASH diet (Dietary Approaches to Stop Hypertension). It was found that continued use of a nutrition

education program delivered totally via the Internet, with no person-to-person contact with health professionals, is associated with significant weight loss, blood pressure lowering, and dietary improvements after 12 months.

6.5 Disadvantage of Web-based Instruction/Learning

Although the Web-based learning provides the benefits. However, WBL is not without its disadvantages. When using the WBL, user is often learning alone which over time may lead to perception of social isolation. Furthermore, the development of WBL can be very expensive. The technical problems of computer hardware, computer software, and network system (bandwidth and limits of HTML) may limit the number of users as well as the user ability and the individualized learning can lead the users lake of motivation and negligent/quit easily. Finally, instructor will have to spend sometimes learning the new learning technology.

CHAPTER IV
MATERIALS AND METHODS

This study was designed to develop a multimedia website nutrition education tool for meal planning. A quasi-experimental study was conducted in pre-hypertensive and hypertensive subjects to evaluate the effectiveness of the developed tool. The aimed of this study was to evaluate the subject's; 1) Knowledge of the disease and meal planning, 2) Attitude on hypertension awareness and management, 3) Overall satisfaction with the developed educational tool. 4) Baseline anthropometric parameter and dietary intake.

Study protocol

The study consists of 2 phases as follows:

Phase 1: Development of multimedia website nutrition education tool

Phase 2: Evaluation the effectiveness of the developed multimedia website tool

Ethical consideration

The study was approved by the Committee on Human Rights Related to Research Involving Human Volunteers, Mahidol University. All the subjects were voluntary and the time wasted by the subjects was compensated (Appendix A).

Phase 1: Developing the multimedia website educational tool

A multimedia website nutrition educational tool that was easy for learning. The developed tool was presented using multimedia such as video clips presentation, application programs for self assessment, text, pictures, and web-board.

This phase of the study involve the development of the educational tool and content validation by a committee of experts. Various questionnaires were also developed during this phase.

Phase 1: Preparation and developing the multimedia website educational tool

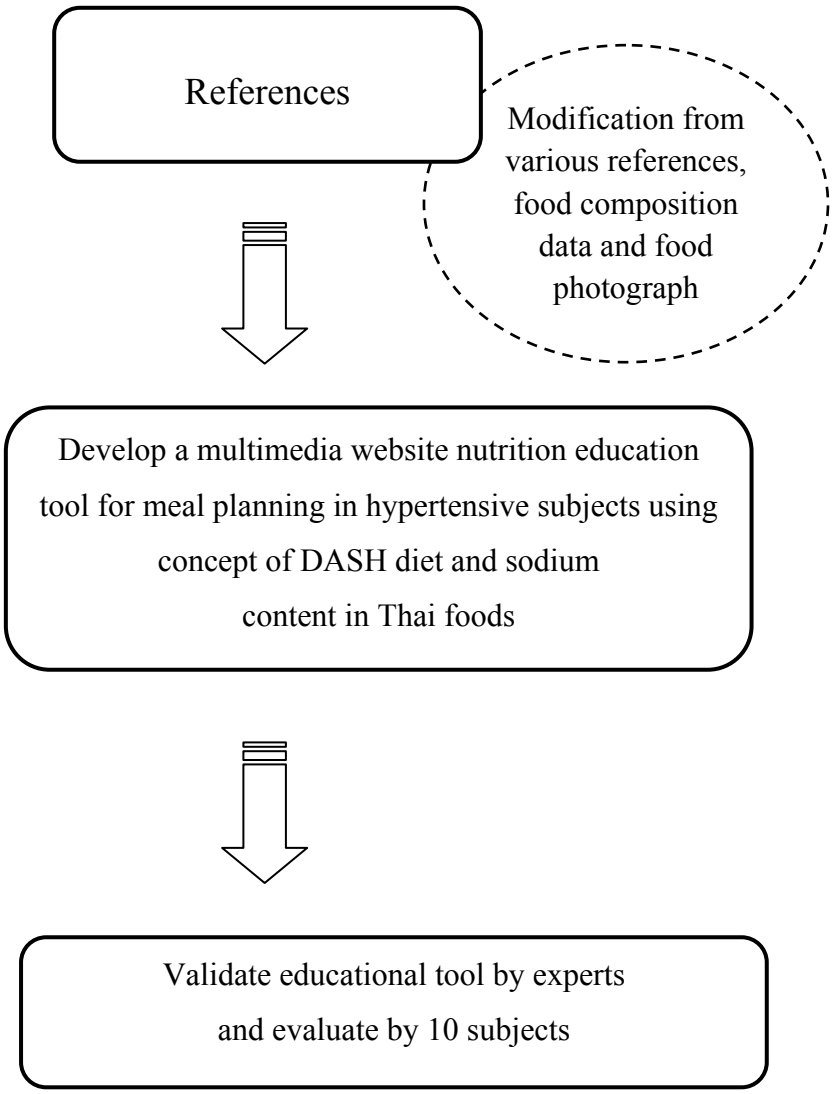

Figure 5 Flow chart representing phase 1: Development of a multimedia website nutrition education tool

4.1 Research and preparation for the developing educational tool

The information related to hypertension knowledge and nutrition from various references were sought from both university library as well as from reliable sources of the internet and developed educational tools. The contents of the developed tool were modified from various sources as follows; [9, 17, 29-31]

- The Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure. The seventh report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC VII).
- Textbook of Krause's Food and Nutrition Therapy, edition 12th, 2008.
- The Thesis for the master degree of science: Developing a nutrition education tool: Booklet for sodium content guideline in Thai foods.
- Food exchange lists for Thais.
- Nutritive values of Thai foods.
- Thai food composition Tables.

4.2 Planning for constructed multimedia website

Design a pattern presentation, content, pictures and application programs of web-based system.

The developing website and components as follows;

1. Set the main target and website objectives, especially the learning-centered target of hypertensive subjects via multimedia website.
2. Design diagram and website layout
3. Gather content, related pictures.
4. Analyze the content part to minimize the learning process.
5. Create the site map to arrange inter- and intra- website connection.
6. Design the web page, including heading, content, pictures, application programs and connection that show on the operating page.
7. Register domain name (wwwe.kindee-jaidee.com)
8. Create and test the website operation system.

4.3 Main topic categories of multimedia website

All the necessary topics were created and presented as a simple menu. Website was designed using simple words and font which easy for understanding including colourful template and pictures. The created menus and contents were done under the scope of each topic. A site map of a multimedia website education as shown below;

- **Main web page**
  - Information board
  - User log-in and log-out
  - Personal profile
  - Web-board
  - Contact us: e-mail function
- **Jaidee-video**
  - Hypertension knowledge #1: "Do you have hypertension?"
  - Hypertension knowledge #2: "Effects of hypertension on the body"
- **Nutrition clinic**
  - Application program #1: "Body mass index (BMI) assessment "
  - Application program #2: "Energy and nutrients requirement"
  - Application program #3: "Food intake assessment/record"
- **Jaidee-library**
  - Knowledge of hypertension
- **Meet the dietitian**
  - Nutrients influencing blood pressure
  - Concept of DASH diet
  - Concept of sodium traffic-light
  - Meal planning
  - Nutrition labelling
- **Kindee-jaidee food gallery**
  - Food photo gallery with information and colour cards for sodium restriction

- **Test your knowledge**
  - Application program to test user's basic knowledge for control hypertension
- **Jaidee-fitness**
  - Application program #1: "Energy expenditure in various activities"
  - Application program #2: "Appropriate heart rate for exercise"
  - Exercise guidance
- **Relaxing music room**
  - Relaxing music
- **Laboratory Results**

4.4 Validation of nutrition knowledge test and multimedia website nutrition education tool

All contents and applications were validated by the experts. Afterward, a test and website revision was conducted by 10 adult users. After using the developed multimedia website, the content, the language, the website's template, as well as the illustration were agreed by the 10 adult users. Most subjects had positive comments about the developed tool.

Phase 2: Evaluation the effectiveness of the developed multimedia website tool

The purposes of this phase:

1. To assess the subject's knowledge and understanding of meal planning using the concept of DASH diet and sodium content in foods via the developed multimedia website education tool.
2. To assess the subject's attitude on hypertension awareness and management
3. To assess the subject's overall satisfaction with the developed multimedia website education tool.
4. To assess the baseline anthropometric parameter and dietary intake of the subjects.

4.5 Instruments for data collection

4.5.1 Instrument to collect the baseline characteristic of the subjects

Questionnaires were used to obtain the baseline characteristic of the subjects (Appendix B) which were divided into 2 parts. The 1st part was demographic characteristic data such as personal information, health information, basic knowledge on diet and hypertension, and computer and internet usage. The 2nd part was 3-day food record.

4.5.2 Instrument to collect the subject's anthropometric parameters and blood pressure

- Measuring tape was used to measure waist circumference
- Omron HBF-362 Karada Scan Body Composition Monitor was used to measure body composition
- Digital sphygmomanometer model: Kenz-BPM SP1 was used to measure blood pressure

4.5.3 Instrument for evaluate the subject's knowledge and understanding

The Pre-test and Post-test questionnaire (Appendix C) was used to assess the subject's knowledge and understanding which concerned about disease, meal planning including physical activities for hypertensive person at week 0 and week 5. The pre-test and post-test questionnaire consists of 2 parts. The 1st part was a multiple choices questionnaire consisted of 15 questions and the 2nd part was true or false questionnaire consisted of 5 questions. A similar grading system was also used by Janejob in a similar study and it was found to be reliable [17].

The scoring method was:

Correct answer score	1	point
Incorrect answer score	0	point
Total score	20	points

The scores were classified into 3 levels as follows [32]:

Scoring	≤ 50%	identified as Low knowledge level
Scoring	51-75%	identified as Moderate knowledge level
Scoring	>75%	identified as High knowledge level

4.5.4 Assignment for increasing knowledge and encouraging subjects.

The online questionnaire was used for homework assignment. The questionnaire consisted of 10 questions of as a multiple choices.

The scoring method was:

Correct answer score	1	point
Incorrect answer score	0	point
Total score	10	points

The scores were classified into 3 levels as follows [32]:

Scoring	≤ 50%	identified as Low knowledge level
Scoring	51-75%	identified as Moderate knowledge level
Scoring	>75%	identified as High knowledge level

4.5.5 Instrument for evaluating attitude on hypertension awareness and hypertension management

The Pre-test and Post-test attitude questionnaire which modified from valid questionnaire [139] (Appendix B) composed of 15 questions which were 8 positive attitude questions and 7 negative questions. The questions were Likert scale on 5 levels responses of attitude questionnaire.

The scoring method was:

<u>Positive question</u>

Strongly agree	5	Points
Agree	4	Points
Neither agree nor disagree	3	Points
Disagree	2	Points
Strongly disagree	1	Point

Negative question

Strongly agree	1	Point
Agree	2	Points
Neither agree nor disagree	3	Points
Disagree	4	Points
Strongly disagree	5	Points

The scores were classified into 3 levels as follows:

Average score	3.50 - 5.00	identified as Good attitude level
Average score	2.50 - 3.49	identified as Fair attitude level
Average score	1.00 - 2.49	identified as Poor attitude level

4.5.6 Subject's satisfaction with the developed multimedia website tool

The questionnaire (Appendix D) was used to evaluate subject's satisfaction with the developed multimedia website nutrition education tool. The satisfaction was evaluated from the aspect of knowledge content, website format, font, illustration, and application programs. The closed ended questions with 4 levels were used and the comments of subjects were collected as well.

Levels of evaluation were;

Very good	4 scores
Good	3 scores
Fair	2 scores
Need improvement	1 score

4.6 Study design

This study design was a quasi-experimental design, which was designed to evaluate the effectiveness of the developed tool on the knowledge, attitude and overall satisfaction of the person with pre-hypertensive and hypertensive.

4.7 Sample size calculation

Sample size estimation was based on the sample size calculation for a single proportion, as follows [17]:

$$n = \left[\frac{Z_\alpha \sqrt{\pi_0(1-\pi_0)} - Z_\beta \sqrt{\pi_1(1-\pi_1)}}{\pi_1 - \pi_0} \right]^2$$

Whereas,

N = Number of subjects

Z_α = 5% Type I Error (1.96)

Z_β = 95% Confidential (- 1.28)

π_0 = Baseline knowledge score 0.16 (From the previous study)

$\pi 1 - \pi_0$ = Expected probability of knowledge improvement 0.25 (25% Expected)

Therefore, number of subjects was calculated to be 30. With ±20% dropout rate, total sample size was estimated to be 33 subjects.

Inclusion criteria:

1. Adult males or females age between 20-60 years.
2. Blood pressure > 120/80 mmHg
3. Ability to learn and assess the value of numerals.
4. Ability to use computer and internet.
5. Willingness to participate the study.

Exclusion criteria:

1. Known as secondary hypertension.
2. Unwilling to participate the study.

4.8 Research site

The study site of this study was at Medical Department, Krung Thai Bank Public Company Limited, Bangkok.

Phase 2: Evaluation the effectiveness of the multimedia website tool

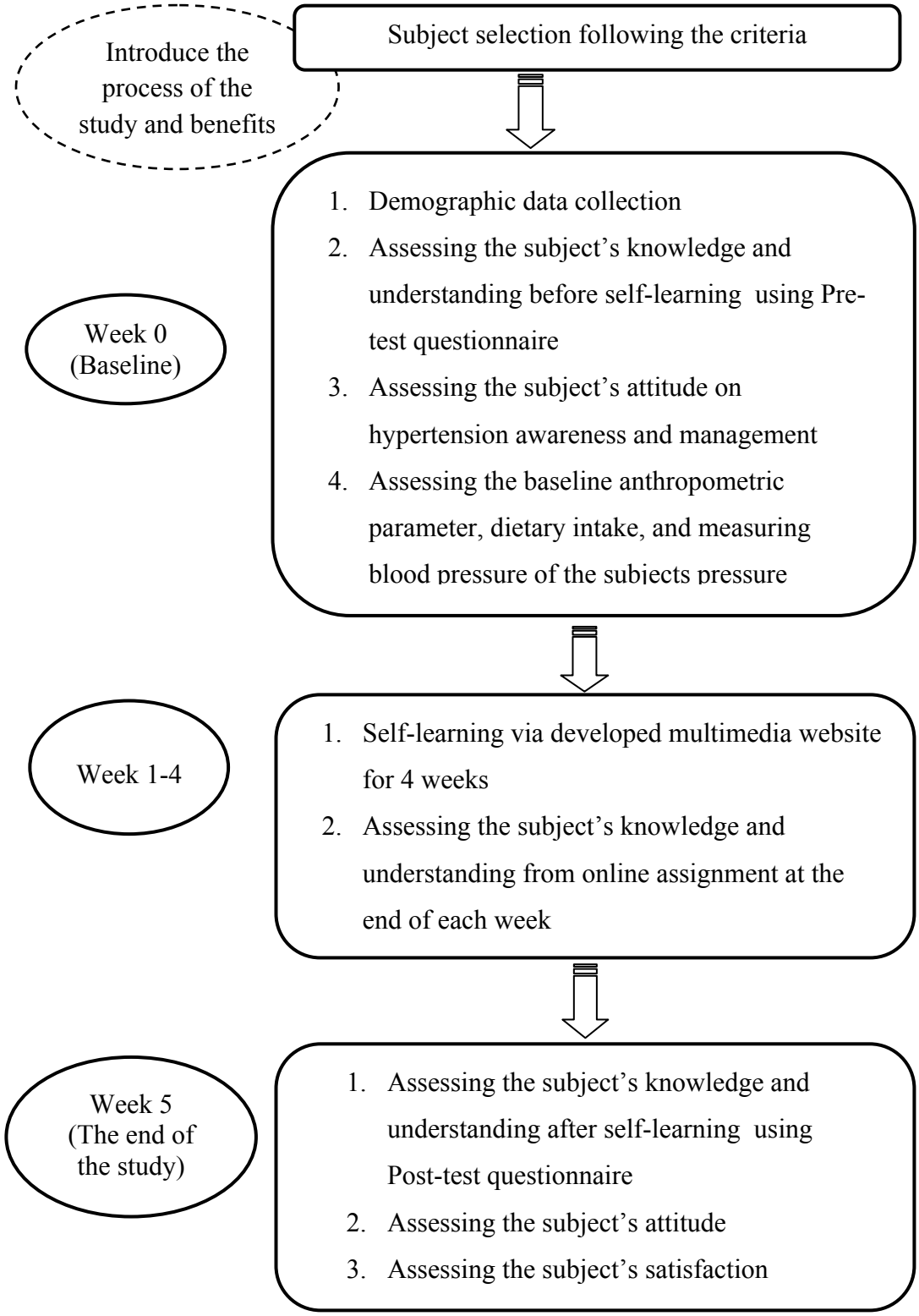

Figure 6 Flow chart representing phase 2: Evaluation the effectiveness of a multimedia website nutrition education tool

4.9 Research study procedure (Baseline, Week 0)

An announcement of the research project was done via intra-email and poster. Total 38 subjects who met the inclusion criteria were selected from a group of state enterprise employees who attend Medical Department, Krung Thai Bank Public Company Limited were recruited in this study for 4 weeks. The introduction was done by researcher at week 0 to introduce the details of research project. After participants signed inform consent, the baseline assessment was done. The assessment were performed to evaluate the effectiveness of the multimedia website nutrition education tool in a person who had pre-hypertension and hypertension by assessed the knowledge of hypertension, attitude on hypertension awareness and management, blood pressure, 3-day food record, anthropometric parameters including collect the subject's demographic characteristic data such as personal information, health information, and website usage.

4.9.1 Anthropometric, dietary intake, and blood pressure assessment

The subject's anthropometric parameters were measured and collected by the same researcher. The assessment was performed to collect the data as follows;

4.9.1.1 Body Mass Index; BMI

Body mass index was measured automatically by the bio-electrical impedance analysis (BIA) model: Omron HBF-362 which calculated from the following formula; BMI (hg/m^2) = Weight (kg) / Height (m) ^{2}

The classification of body mass index for Asian adults aged above 20 years for Asian people is shown in Table 4.

4.9.1.2 Waist circumference

Waist circumference was measured using a measuring tape at the middle level between the lower rib and iliac crest to classify the risk of abdominal obesity. The cut-off waist circumference in adult for Asian aged 20 years above was $\leq$ 90 cm. in male and $\leq$ 80 cm. in female.

4.9.1.3 Percent tissue body fat and visceral fat level

Percent tissue body fat and visceral fat level was measured using Karada Scan Body Composition Monitor model: Omron HBF-362. The subject

was asked to input personal values of age, gender, and height into the body logic pro. The subject grips the device handles and hold arms straight out at 90° angle to the body. Electrodes in the foot and hand grips sensor pads send a low, safe signal through the upper and lower body. The body fat percentage, visceral fat level including weight and body age are calculated automatically in seconds. The percentage of tissue body fat and visceral fat level are shown in Table 5-6

4.9.1.4 Blood pressure measurement

Subject's blood pressure was measured by using the same digital sphygmomanometer model: Kenz-BPM SP1. The subjects were asked to rest five minutes before measuring. Blood pressure was measured on the right hand side in the sitting position. The measurement was done twice and used the average number to representing blood pressure on that day.

4.9.1.5 Dietary assessment

Dietary intake was measured using 3-day food record at baseline. Subjects were advised by researcher before doing food record for 3 days (2 weekdays and 1 weekend day). Energy and nutrients intakes were calculated using the INMUCAL program (version WD.1.1).

Table 4 Classification of body mass index for Asian adults aged above 20 years for Asian people.

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

Source: World Health Organization the Asia-Pacific perspective Redefining Obesity and its treatment. February, 2000 [34].

Table 5 Interpretation of percentage body fat results

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

Source: The values for obesity judgment proposed by Lohman, 1986 and Nagamine, 1972 [35].

Table 6 Interpretation of visceral fat level results

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

Source: The values for obesity judgment proposed by Lohman, 1986 and Nagamine, 1972 [35].

4.9.2 Self-learning via developed multimedia website

After completed all the assessment at baseline (week 0) all subjects were asked to registered the website kindee-jaidee.com in order to start self-learning at week 1 until week 4. During the study period, subjects were contacted from researcher via e-mail address and telephone for helping and solving the problems. In each week, subjects received a self-learning topic and online homework assignment, 4 self-learning topics and assignment for 4 weeks. Learning topics in each week are presented in Table 7-10

Table 7 The scope and outline of a multimedia website: Learning topic week# 1

Topic	Objective	Menu content outline	Self-learning technique
General knowledge of hypertension	1. Understanding the characteristic of the disease and the result of lack of care 2. To learn the cause, related factors, sign and symptom of the disease 3. Can identify the level of hypertension 4. To learn the guideline for hypertension treatment and its benefits	Kindee-jaidee library Topics: 1. What is hypertension? 2. When will we call "Hypertension" 3. Classification of hypertension 4. Influence factors of blood pressure 5. Complications of hypertension 6. Hypertension treatment	Topics: 1. Jaidee-videos knowledge 2. Test your knowledge

Table 8 The scope and outline of a multimedia website: Learning topic week# 2

Topic	Objective	Menu content outline	Self-learning technique
Meal planning technique	1. To learn the outcomes of uncontrolled diet related blood pressure 2. To learn the nutrients affecting to blood pressure 3. To understanding the concept of DASH diet 4. To know the technique of sodium traffic-light concept 5. Can assess the appropriate food intake using sodium traffic-light concept	Meet the dietitian Topics: 1. Introduction 2. Which way to control blood pressure 3. Kindee-jaidee 4. What is portion size? 5. Technique of sodium control 6. Meal planning approach to control hypertension 7. Food-based dietary guideline for Thais.	Topics: 1. BMI calculation program 2. Meal planning program 3. Food intake and record program 4. Kindee-jaidee food photo gallery 5. Test your knowledge application program

Table 9 The scope and outline of a multimedia website: Learning topic week# 3

Topic	Objective	Menu content outline	Self-learning technique
Nutrition label and food exchange	1. Can read a nutrition label on food product to select healthy food choices 2. To learn the food portion in order to choose and assess food intake appropriate to their energy and nutrients requirement	Meet the dietitian Topics: 1. Choose smart with nutrition label 2. Food-based dietary guideline for Thais. 3. Remember...how to control blood pressure	Topics: 1. Test your knowledge application program 2. Kindee-jaidee food photo gallery 3. Flash JAVA program on how to read nutrition label

Table 10 The scope and outline of a multimedia website: Learning topic week# 4

Topic	Objective	Menu content outline	Self-learning technique
Exercise and physical activities for hypertension	1. To understanding the benefits of exercise and physical activities to control blood pressure 2. To learn the type of exercise for a good health 3. Can assess an appropriate exercise individually	Jaidee fitness Topics: 1. Exercise guidance	Topics: 1. Appropriate heart rate for exercise application program 2. Energy expenditure in various activities application program 3. Test your knowledge application program 4. Jaidee web-board for sharing idea

4.9.3 Assessment after self-learning via a multimedia website (Week 5)

After completed 4 weeks self-learning and online homework assignments, the subjects were assessed their knowledge, attitude on hypertension awareness and management. The satisfaction with the developed multimedia website tool was obtained from the subjects using satisfaction questionnaire.

Data analysis

1. Statistical analysis was performed by using the Statistical Package for Social Sciences / Personal Computer (SPSS/PC), for window version 15.0 and the differences of $p<0.05$ were considered to be significant.
2. The personal information was analyzed using descriptive statistics, such as percentages, mean, and standard deviation.
3. Paired t-test was used to compare the score of the subject's knowledge and understanding between Pre-Post-test and subject's attitude on hypertension awareness and management.
4. The correlation of accessing the website during the study and subject's knowledge score was analyzed using Pearson's correlation.
5. The evaluation of the developed education tool satisfaction was determined as percentage, mean, and standard deviation.

CHAPTER V
RESULTS

This study was to develop multimedia website nutrition education tool for meal planning in pre-hypertensive and hypertensive subjects. The results of the study were presented into 2 phases. First phase was the development of the develop tool and the second phase was to evaluate the effectiveness of the education tool.

5.1 Phase 1: Development of the education tool

The developed tool was a multimedia website nutrition education tool for meal planning in hypertensive subjects. All the necessary topics were gathered and created as a simple menu. The website topic categories were shown in table 11. A total 9 main menus were constructed which were divided into 6 self-assessment application programs, 2 videos of hypertension knowledge, 16 knowledge topics and 1 food gallery. The developed tool was registered a domain name called **"www.kindee-jaidee.com"**

Table 11 The website topic categories presented in "Kindee-jaidee"

Topic Categories	Subtopic
Video Clips	- Do you have hypertension?
	- Effects of hypertension on the body
Nutrition Clinic	- Body mass index (BMI) assessment
(3 Programs assessment)	- Nutritional requirement
	- Food intake assessment/record
Kindee-jaidee Library	- What is hypertension?
	- When will we call "Hypertension"
	- Classification of hypertension
	- Influence factors of blood pressure
	- Complications of hypertension
	- Hypertension treatment

Table 11 The website topic categories presented in "Kindee-jaidee"
(Cont.)

Topic Categories	Subheading
Meet the Dietitian	- Introduction
	- Which way to control blood pressure
	- Kindee-Jaidee
	- Technique of sodium control
	- What is potion size?
	- Meal planning operation to conquer hypertension
	- Choose smart with nutrition label
	- 9 respects of nutrition regulation
	- Remember ... how to control blood pressure
Kindee-jaidee Gallery	- Foods information and pictures
Jaidee Fitness	- Appropriate heart rate for exercise
(2 Programs assessment)	- Energy expenditure in various activities
	- Exercise guidance
Test your knowledge	- General knowledge testing on food
(1 Program assessment)	and hypertension
Relaxing music room	- Instrumental music to relieve stress
Laboratory Results	- Understanding your lab tests

A multimedia website nutrition education tool was designed and developed which consist of total 31 web pages including home page. The content topic was divided into 3 main sections. First section: "knowledge of hypertension". It started with video clips about the knowledge of hypertension to make user understand the cause and the outcome of the disease if left untreated. The library topic also described about the subheading of hypertension knowledge as text message and

pictures. The final format of the main web-paged and first section of the website is shown in figure 7-9

Second section: “self-assessment programs”. To control hypertension with diet and exercise, user need to know his/her status and nutrients requirement to planning an appropriate meal including physical activities in each day. The programs were designed to provide easy and convenient to user to assess. The final format of the second section of the website is shown in figure 10-15

Third section: “diet and exercise”. All the necessary content of diet and exercise to control hypertension were gathered and developed. Diet control using principle of DASH diet and the concept of sodium traffic light were used in this developed tool. Information and pictures of food categorize were represented in the website. INMUCAL program was used to calculate the nutrients of various foods. The final format of the third section of the website is shown in figure 16-20

Figure 7 Main web-paged of “www.kindee-jaidee.com”

Figure 8 First section: “VDO clips - Knowledge of hypertension” (Part 1)

Figure 9 First section: “Knowledge of hypertension” (Part 2)

Figure 10 Second section: "self-assessment programs" (Part 1)

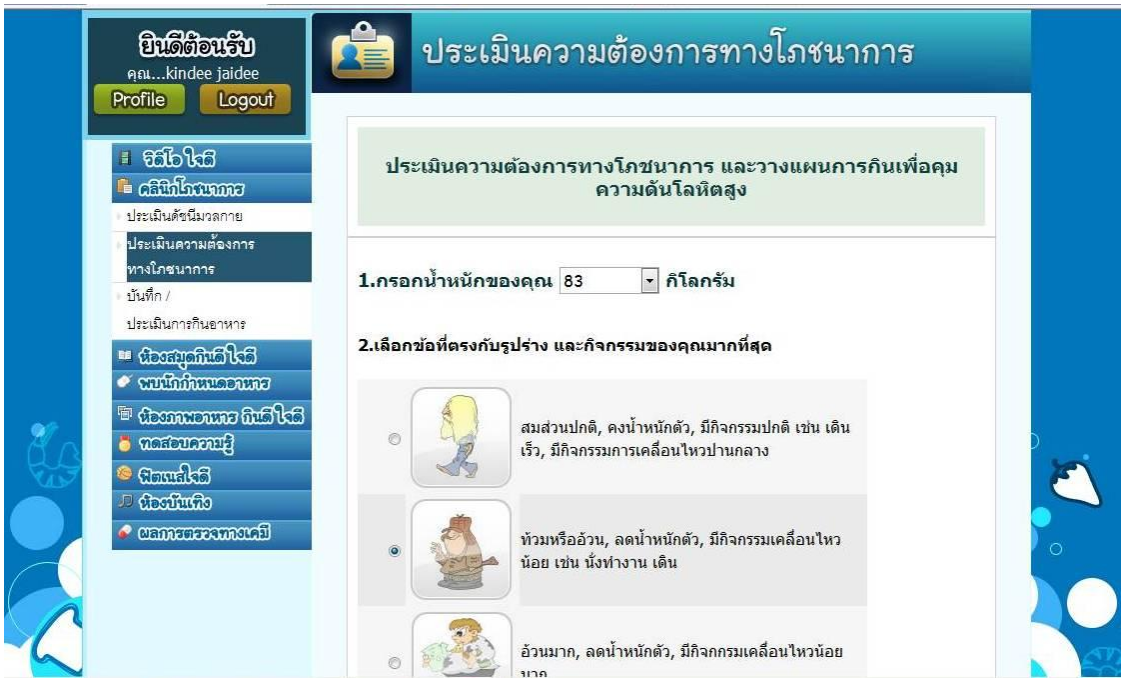

Figure 11 Second section: "self-assessment programs" (Part 2)

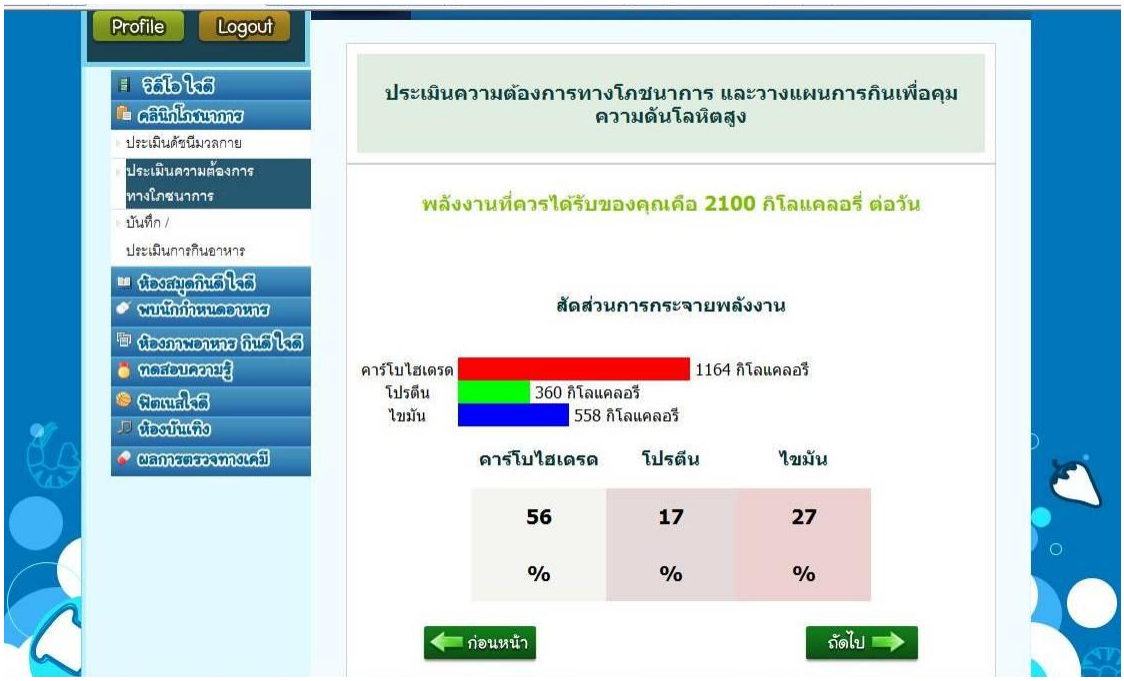

Figure 12 Second section: “self-assessment programs” (Part 3)

Figure 13 Second section: “self-assessment programs” (Part 4)

Figure 14 Second section: "self-assessment programs" (Part 5)

Figure 15 Second section: "self-assessment programs" (Part 6)

Figure 16 Third section: “diet and exercise” (Part 1)

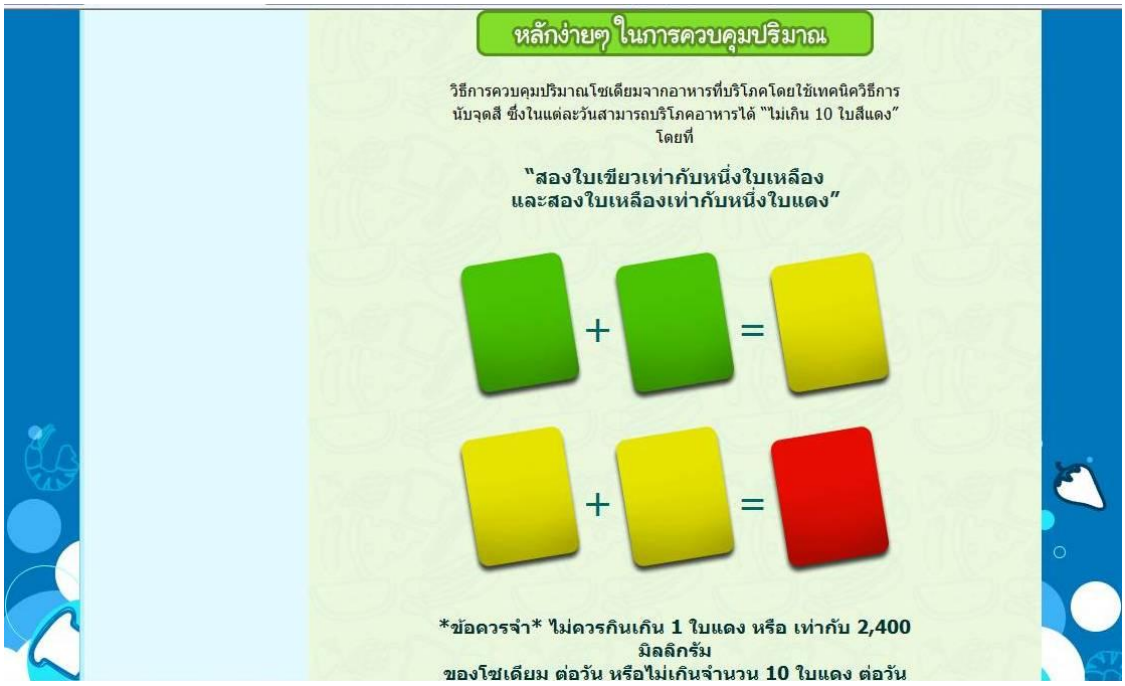

Figure 17 Third section: “diet and exercise” (Part 2)

Figure 18 Third section: "diet and exercise" (Part 3)

Figure 19 Third section: "diet and exercise" (Part 4)

Figure 20 Third section: “diet and exercise” (Part 5)

5.2 Phase 2: Evaluation the effectiveness of the education tool

5.2.1 Demographic characteristics of the study subjects

The demographic characteristics of the subjects were shown in Table 12. The total 38 subjects met inclusion criteria were recruited for this study. All the study subjects were 21 male and 17 female (55.3% and 44.7% respectively). The age range of subjects was from 31 to 60 years, with a mean age of 49.71 ± 6.82 years. 7.9% of the subjects belonged to the 31-40 age group, 42.1% of the subjects belonged to the 41-50 age group and 50% of the subjects belonged to the 51-60 age group. Most of the subjects were married (79%). The majority of subject's education level was bachelor degree (71%) and had incomes more than 60,000 baht (55.3%). Most of the subjects used computer and internet everyday (79% and 57.9% respectively).

Table 12 Demographic characteristics of the subjects

Characteristics	Frequency (n)	Percent (%)
Gender		
Male	21	55.3
Female	17	44.7
Age (year)		
31-40	3	7.9
41-50	16	42.1
51-60	19	50
Mean = 49.71, S.D. = 6.82	Minimum = 33	Maximum 60
Status		
Single	7	18.4
Married	30	79
Divorce / Widow	1	2.6
Education		
Secondary	4	10.5
Diploma	2	5.3
Bachelor's degree	27	71
> Bachelor's degree	5	13.2

Table 12 Demographic characteristics of the subjects (cont.)

Characteristics	Frequency (n)	Percent (%)
Occupation		
State enterprise employees	36	94.7
Others	2	5.3
Income (baht/month)		
20,001-39,000	10	26.3
40,000-59,999	7	18.4
> 60,000	21	55.3
How often do you use your computer?		
3-5 times / week	8	21
Everyday	30	79
How often do you use an internet?		
< 1 time / week	3	7.9
2-3 times / week	1	2.6
3-5 times / week	12	31.6
Everyday	22	57.9

5.2.2 Health information of the study subjects

The health information of 38 subjects in this study was obtained from the general questionnaire which was given before the beginning of the study as presented in Table 13. Most of the subjects were none smoker (97.3%). More than a half was none alcohol drinkers (73.7%) while the rest of subjects were alcohol drinkers with 10.5% of liquor, 15.8% of beer and 7.9% of wine. More than a half of the subjects (52%) had hypertension 1-5 years. Most subjects used anti-hypertensive drug to control their blood pressure whereas 18.42% of subjects did both diet control and exercise. Only 5 subjects (13.15%) used anti-hypertensive drug, diet

control, and exercise. About a half of subjects also had other present illness (50%) including dyslipidemia (23.7%), diabetes (21%), bone disease (5.3%), asthma or allergy (5.3%), and peripheral neuropathy (2.7%).

Table 13 Health information of the subjects

Characteristics	Frequency (n)	Percent (%)
Do you Smoke?		
No	37	97.3
Yes	1	2.7
Do you drink alcohol beverage?		
No	28	73.7
Yes	10	26.3
- Liquor	4	10.5
- Beer	6	15.8
- Wine	3	7.9
Do you control your weight?		
No	17	44.7
Yes	21	55.3
How long do you have hypertension?		
< 1 year	7	18.4
1-5 year	20	52.6
6-10 year	6	15.8
> 10 year	5	13.2
Do you treat your hypertension?		
No	3	7.89
Yes, treat by …		
- Diet control	0	0
- Exercise	3	7.89
- Anti-hypertensive drugs	14	36.84

Table 13 Health information of participants (Cont.)

Characteristics	Frequency (n)	Percent (%)
- Diet control and exercise	7	18.42
- Anti-hypertensive drugs and diet control	3	7.89
- Anti-hypertensive drugs and Exercise	3	7.89
- Anti-hypertensive drug, diet control, and exercise	5	13.15
Do any members in your family have hypertension?		
No	8	21
Yes	30	79
- Father / mother	26	68.4
- Husband / wife	5	13.2
- Children	3	7.9
- Brother / sister	11	29
Do you have other present illness?		
No	19	50
Yes	19	50
- Diabetes	8	21
- Dyslipidemia	9	23.7
- Bone disease	2	5.3
- Asthma or allergy	2	5.3
Others (Peripheral neuropathy)	1	2.7

5.2.3 Basic knowledge on diet and hypertension of the subjects

Most of the subjects have never been received information on DASH diet or sodium content in foods before (81.6%) as well as the information on food exchange (89.5%).

Table 14 Basic knowledge on diet and hypertension of the subjects

Characteristics	Frequency (n)	Percent (%)
Have you ever been received information on DASH diet or sodium content in foods?		
No	31	81.6
Yes	7	18.4
- Books / Magazines	4	10.5
- Radio	1	2.6
- Television	3	7.9
- Internet	3	7.9
- Friends / family	2	5.3
- Others (Information board at Krung Thai Bank Clinic)	4	10.5
Have you ever been received information on food exchange?		
No	34	89.5
Yes	4	10.5
- Books / Magazines	3	7.9
- Radio	1	2.6
- Television	2	5.3
- Internet	2	5.3
- Friends / family	1	2.6
- Others (Information board at Krung Thai Bank Clinic)	2	5.3

5.2.4 Baseline dietary intake of the subjects

The subject's average dietary intakes before the beginning the study (week 0) is shown in Table 15. The energy intake of 38 subjects was 1,752.39 ± 223.77 kcal and the percentages of energy distribution of carbohydrate, protein, and fat were 60.36%, 12.57%, and 27.08% respectively. Most subjects had percentage of carbohydrate intake slightly higher than the recommendation (60.36%) whereas percentage of protein was lower than the recommendation. The mean cholesterol was 340.03 ± 109.01mg and most subjects (94.73%) had cholesterol intake above the recommendation. Most subjects (97.36%) consumed dietary fiber lower than the recommended value. The average sodium intake of subjects was 2,846.82 ± 415.37 mg with the highest and lowest of sodium consumption at 3,485 and 1,803.46 mg respectively. Most subjects had excessive sodium intake (86.84%) while only 13.2% was at recommended range of sodium intake. The results showed that potassium and calcium intake of the subjects were lower than the recommended values.

Table 15 Baseline dietary intake of the subjects

Variables	Total (38) n (%)	Male (21) n (%)	Female (17) n (%)	Recommended value
Energy (kcal)				
Mean	1,752.39 ± 223.77	1,733.79 ± 199.44	1,775.37 ± 255.06	-
Maximum	2,253.63	2,173.57	2,253.63	
Minimum	1,349.27	1,340.27	1,403.82	
Carbohydrate (g)				
Mean	264.01 ± 42.47	264.93 ± 40.66	262.87 ± 45.84	-
Maximum	344.01	332.36	344.01	
Minimum	173.13	189.32	173.13	
Protein (g)				
Mean	54.86 ± 13.55	50.9 ± 12.79	59.74 ± 13.20	-
Maximum	78.36	77.17	78.36	
Minimum	30.92	30.92	38.23	
Fat (g)				
Mean	52.99 ± 15.48	52.27 ± 16.22	53.88 ± 14.97	-
Maximum	79.61	79.61	78.44	
Minimum	25.14	25.14	28.10	

Table 15 Baseline dietary intake of the subjects (cont.)

Variables	Total (38) n (%)	Male (21) n (%)	Female (17) n (%)	Recommended value
Carbohydrate (%)				
At recommendation	14 (36.8%)	8 (38.1%)	6 (35.3%)	50-60% of total
Under recommendation	4 (10.53%)	2 (9.52%)	2 (11.76%)	calories*
Over recommendation	20 (62.63%)	11 (52.38%)	9 (52.94%)	
Mean	60.36 ± 7.12	61.23 ± 7.42	59.29 ± 6.79	
Maximum	73.79%	73.79	67.38	
Minimum	42.53%	47.70	42.53	
Protein (%)				
At recommendation	8 (21.1%)	2 (9.5%)	6 (35.3%)	
Under recommendation	30 (78.95%)	19 (90.48%)	11 (64.71%)	~15% of total
Over recommendation	0 (0%)	0 (0%)	0 (0%)	calories*
Mean	12.57 ± 2.88	11.78 ± 2.77	13.53 ± 2.78	
Maximum	19.25	16.07	19.25	
Minimum	6.67	6.67	9.57	

*Reference: National Cholesterol Education Program (Adult Treatment Panel III), 2002. (153)

Table 15 Baseline dietary intake of the subjects (cont.)

Variables	Total (38) n (%)	Male (21) n (%)	Female (17) n (%)	Recommended value
Fat (%)				
At recommendation	15 (39.47%)	9 (42.86%)	6 (35.30%)	25-35% of total calories*
Under recommendation	17 (44.74%)	8 (38.10%)	9 (52.94%)	
Over recommendation	6 (15.79%)	4 (19.05%)	2 (11.76%)	
Mean	27.08 ± 6.79	26.99 ± 7.35	27.18 ± 6.26	
Maximum	43.46	43.46	39.60	
Minimum	14.70	14.70	17.75	
Cholesterol (mg)				
At recommendation	2 (5.26%)	2 (9.52%)	0 (0%)	< 200 mg*
Under recommendation	0 (0%)	0 (0%)	0 (0%)	
Over recommendation	36 (94.73%)	19 (90.48%)	17 (100%)	
Mean	340.03 ± 109.01	352.59 ± 120.16	324.53 ± 94.70	
Maximum	687.21	687.21	512.04	
Minimum	172.47	172.47	212.11	

*Reference: National Cholesterol Education Program (Adult Treatment Panel III), 2002. (153)

Table 15 Dietary intake of the subjects (cont.)

Variables	Total (38) n (%)	Male (21) n (%)	Female (17) n (%)	Recommended value
Dietary fiber (g)				
At recommendation	1 (2.63%)	0 (0%)	1 (5.88%)	20-30 g**
Under recommendation	37 (97.36%)	21 (100%)	16 (94.12%)	
Over recommendation	0 (0%)	0 (0%)	0 (0%)	
Mean	12.88 ± 4.19	12.92 ± 4.11	12.83 ± 4.40	
Maximum	21.84	21.84	19.43	
Minimum	5.38	7.13	5.38	
Sodium (mg)				
At recommendation	5 (13.2%)	2 (9.52%)	3 (17.65%)	≤ 2,400 mg**
Under recommendation	0 (0%)	0 (0%)	0 (0%)	
Over recommendation	33 (86.84%)	21 (90.48%)	14 (82.35%)	
Mean	2,846.82 ± 415.37	2,898.74 ± 397.56	2,782.68 ± 439.90	
Maximum	3,485	3,485	3,474.42	
Minimum	1,803.46	1,803.46	1,904.31	

**Reference: ปริมาณสารอาหารอ้างอิงที่ควรได้รับประจำวันสำหรับคนไทย พ.ศ. 2546 (154).

Table 15 Dietary intake of the subjects (cont.)

Variables	Total (38) n (%)	Male (21) n (%)	Female (17) n (%)	Recommended value
Potassium (mg)				
At recommendation	0 (0%)	0 (0%)	0 (0%)	> 3,500 mg**
Under recommendation	38 (100%)	21 (100%)	17 (100%)	
Over recommendation	0 (0%)	0 (0%)	0 (0%)	
Mean	1,803.86 ± 687.87	1,915.76 ± 704.76	1,665.62 ± 660.74	
Maximum	2,952.01	2,952.01	2,948.95	
Minimum	800.63	911.49	800.63	
Calcium (mg)				800-1,000 mg**
At recommendation	0 (0%)	0 (0%)	0 (0%)	
Under recommendation	0 (0%)	0 (0%)	0 (0%)	
Over recommendation	38 (100%)	21 (100%)	17 (100%)	
Mean	467.05 ± 177.83	501.69 ± 169.94	424.26 ± 183.05	
Maximum	746.40	746.40	706.81	
Minimum	188.89	203.99	188.89	

**Reference: ปริมาณสารอาหารอ้างอิงที่ควรได้รับประจำวันสำหรับคนไทย พ.ศ. 2546 (154).

5.2.5 Baseline blood pressure of the subjects

The result of subject's blood pressure at baseline is shown in Table 16-18. The mean systolic and diastolic blood pressure of 38 subjects was 131.26 ± 12.12 and 76.66 ± 10.03 mmHg. A half of subjects (50%) had systolic blood pressure between 120-139 mmHg whereas systolic blood pressure greater than or equal to 140 mmHg and less than 120 mmHg was 26.31% and 23.68% respectively.

Total 26 subjects who receive anti-hypertensive drug had the mean of systolic and diastolic blood pressure 131.62 ± 14.35 and 80 ± 10.98 mmHg respectively. Majority of the subjects had systolic blood pressure between 120-139 mmHg (42.31%) whereas diastolic blood pressure was 80 mmHg (53.85%).

Total 12 subjects who did not receive anti-hypertensive drug had the mean of systolic and diastolic blood pressure 130.50 ± 5.02 and 79 ± 8.11 mmHg respectively. Most of subjects had systolic and diastolic blood pressure between 120-139 mmHg (83.33%) and less than 80 mmHg (58.33%).

Table 16 Blood pressure of 38 subjects

Blood pressure	**Total (38)** n (%)	**Male (21)** n (%)	**Female (17)** n (%)
Systolic Blood Pressure *			
< 120 mmHg	8 (21.05%)	4 (19.04%)	4 (23.52%)
120-139 mmHg	20 (52.63%)	11 (52.38%)	9 (52.94%)
≥ 140 mmHg	10 (26.32%)	6 (28.57%)	4 (23.52%)
Mean	131.26 ± 12.12	132.24 ±10.58	130.06 ± 14.03
Diastolic Blood Pressure *			
< 80 mmHg	21 (55.26%)	11 (52.38%)	10 (58.82%)
80-89 mmHg	8 (23.68%)	4 (19.04%)	4 (23.52%)
≥ 90 mmHg	9 (23.68%)	6 (28.57%)	3 (14.28%)
Mean	76.66 ± 10.03	80.86 ± 10.52	78.24 ± 9.58

*Blood pressure criteria based on JNC 7th [9]

Table 17 Blood pressure of the subjects receiving anti-hypertensive drugs (n=26)

Blood pressure	Total (26) n (%)	Male (13) n (%)	Female (13) n (%)
Systolic Blood Pressure *			
< 120 mmHg	7 (26.92%)	4 (30.77%)	3 (23.08%)
120-139 mmHg	11 (42.31%)	5 (38.46%)	6 (46.15%)
≥ 140 mmHg	8 (30.77%)	4 (30.77%)	4 (30.77%)
Mean	131.62 ± 14.35	132.08 ± 13.35	131.15 ± 15.82
Diastolic Blood Pressure *			
< 80 mmHg	14 (53.85%)	7 (53.85%)	7 (53.85%)
80-89 mmHg	5 (19.23%)	2 (15.38%)	3 (23.08%)
≥ 90 mmHg	7 (26.92%)	4 (30.77%)	3 (23.08%)
Mean	80 ± 10.98	79.92 ± 12.51	80.08 ± 9.72

*Blood pressure criteria based on JNC 7th [9]

Table 18 Blood pressure of the subjects not receiving anti-hypertensive drugs (n=12)

Blood pressure	Total (12) n (%)	Male (8) n (%)	Female (4) n (%)
Systolic Blood Pressure *			
< 120 mmHg	1 (8.33%)	0 (0.00%)	1 (25.00%)
120-139 mmHg	10 (83.33%)	7 (87.50%)	3 (75.00%)
≥ 140 mmHg	1 (8.33%)	1 (12.50%)	0 (0.00%)
Mean	130.50 ± 5.02	132.50 ± 3.74	126.50 ± 72.25
Diastolic Blood Pressure *			
< 80 mmHg	7 (58.33%)	4 (50.00%)	3 (75.00%)
80-89 mmHg	3 (25%)	3 (37.50%)	1 (25.00%)
≥ 90 mmHg	2 (16.66%)	1 (12.50%)	0 (0.00%)
Mean	79 ± 8.11	82.38 ± 6.59	72.25 ± 6.99

*Blood pressure criteria based on JNC 7th (9)

5.2.6 Baseline anthropometric data of the subjects

The baseline subject's anthropometric data are shown in table 19. The assessment of the subject's waist circumference was done by using measuring tape. It was found that total 38 subjects hade mean waist circumference was 94.33 ± 12.62 cm. Total 18 males (85.17%) and 13 females (76.47%) had higher cut-off according to the normal criteria of male and female.

The results of body mass index, percent tissue body fat, and visceral fat level assessed by using bio-electrical impedance analysis (BIA model HBF-362). The mean of body mass index of all subjects was 27.85 ± 5.84 kg/m^2 and were found to be obese stage I, obese stage II, and overweight (42.11%, 23.68%, and 18.42% respectively). A number of overweight in males (28.57%) was higher than females (5.88%) whereas the number of obese stage II found in female subjects (29.41%) more than males subjects (19.04%).

The mean percentage of tissue body fat of total 38 subjects was 31.59 ± 6.64 percent and classified as very high, high, and normal percentage of body fat (68.42%, 23.68%, and 7.79% respectively). The mean of visceral fat level of 38 subjects was 12.84 ± 6.55 and most subjects were found to be high and very high level of visceral fat (21.05% and 36.84%). Sixteen male subjects (76.19%) classified as high to very high visceral fat level and 5 subjects (23.81%) classified as normal whereas female subjects classified as normal, high, and very high level of visceral fat, 64.71%, 11.76%, and 23.53% respectively.

Table 19 Baseline anthropometric data of the subjects

Variables	Total (38) n (%)	Male (21) n (%)	Female (17) n (%)	Normal criteria
Body mass index (kg/m^2)				18.5-22.9 kg/m^2
Normal weight	6 (15.78%)	2 (9.52%)	4 (23.72%)	
Overweight	7 (18.42%)	6 (28.57%)	1 (5.88%)	
Obese I	16 (42.11%)	9 (42.58%)	7 (41.17%)	
Obese II	9 (23.68%)	4 (19.04%)	5 (29.41%)	
Mean	27.85 ± 5.84	27.4 ± 4.92	28.41 ± 6.94	
Maximum	47.1	42.4	47.1	
Minimum	20.2	22.2	20.2	
Waist circumference (cm)				< 80 cm. (Female)*,
Normal	7 (18.42%)	3 (14.28%)	4 (23.52%)	< 90 cm. (Male)*
Higher cut-off	31 (81.57%)	18 (85.17%)	13 (76.47%)	
Mean	94.33 ± 12.62	97.93 ± 9.70	89.88 ± 14.59	
Maximum	101	125	130	
Minimum	60	86	75	

*Reference from World Health Organization criteria [34].

Table 19 Baseline anthropometric data of the subjects (cont.)

Variables	Total (38) n (%)	Male (21) n (%)	Female (17) n (%)	Normal criteria
Tissue body fat (%)				10.0-19.9 (Male)**,
Normal	3 (7.79%)	2 (5.26%)	1 (2.63%)	20.0-29.9
High	9 (23.68%)	5 (13.15%)	4 (10.52%)	(Female)**
Very high	26 (68.42%)	14 (66.66%)	12 (70.58%)	
Mean	31.59 ± 6.64	27.12 ± 4.34	37.12 ± 4.43	
Maximum	46.5	36.8	46.5	
Minimum	19.5	19.5	29.4	
Visceral fat level				
Normal	16 (42.11%)	5 (23.81%)	11 (64.71%)	1-9**
High	8 (21.05%)	6 (28.57%)	2 (11.76%)	
Very high	14 (36.84%)	10 (47.62%)	4 (23.53%)	
Mean	12.84 ± 6.55	14.29 ± 5.96	11.06 ± 6.98	
Maximum	30	30	30	
Minimum	4	7	4	

** Reference from The values for obesity judgment proposed by Lohman, 1986 and Nagamine, 1972 [35].

5.2.7 Subject's knowledge and understanding of meal planning using the concept of DASH diet and sodium content in foods

The assessment of the subject's knowledge and understanding of meal planning using the concept of DASH diet and sodium content in foods were performed by using scores from pre-test and post-test questionnaire and the score from the assignment in each week. The pre-test was performed before the beginning of the study (week 0) and the post-test was performed 4 weeks later after the subjects read all the content in the developed tool. Total 20 questions by giving 1 score for each correct answer and 0 for incorrect answer.

The results of this study show that before using the developed tool, most of the subjects had low and moderate level of knowledge (44.73% and 42.11% respectively) (Table 20). After using the developed tool, the subject's knowledge had improved. Most of the subjects had moderate and high level of knowledge (50% and 42.11% respectively) while only 3 subjects had low level score (7.89%). Comparison the scores between pre-test and post-test, the result revealed that change in post-test knowledge score was significant higher than pre-test score (Table 21). However, when evaluated the correlation between age, gender, education, and knowledge level after used the developed tool it was found that there were no correlations between age, gender, education, and knowledge level

Table 20 Number and percentage of subject's knowledge and understanding before and after using the developed multimedia tool.

Knowledge level	**Pre-Test**		**Post-test**	
	n	%	n	%
Low (≤ 50 % of total score)	17	44.74	3	7.89
Moderate (51-75 % of total score)	16	42.11	19	50
High (> 75 % of total score)	5	13.16	16	42.11
Total	**38**	**100**	**38**	**100**

Table 21 Comparison of the subject's knowledge score between pre-test and post-test

Knowledge score	Pre-Test	Post-test	P-Value
Mean ± S.D.	11.44 ± 3.01	13.65 ± 2.58	0.000*
Minimum	4.00	8.00	
Maximum	17.00	19.00	

*Significant difference at P-value < 0.05, 95% CI.

5.2.9 Subject's knowledge and understanding from assignments

An online questionnaire was given to the subjects with the 4 different topics of knowledge. There were 10 questions in each topic which was a multiple choices. The scoring was given 1 score for each correct answer and 0 for incorrect answer. The classification of the knowledge levels were based on the scores, when a subject scored ≤ 50 % correct of the total score was classified as low knowledge level, 51-75 % correct of the total score was classified as moderate knowledge level, and > 75 % correct of the total score was classified as high knowledge level. The result is shown in table 22

Table 22 Subject's knowledge and understanding from assignments

Assignments	Knowledge level		
	Low n (%)	Moderate n (%)	High n (%)
Week 1	0 (0.00%)	20 (52.63%)	18 (47.36%)
Week 2	4 (10.52%)	19 (50.00%)	15 (39.47%)
Week 3	7 (18.42%)	26 (68.42%)	5 (13.15%)
Week 4	2 (5.26%)	17 (44.73%)	19 (50%)

5.2.10 Frequency of accessing the website and knowledge level

During the 4 weeks of study period, subjects were assigned to access the website to read, self-assessment, and to test the knowledge and understanding the content in each week. The result in table 23 show that average of accessing the website during the study was 2 times a week. In addition, the correlation between frequency of accessing the website and knowledge level after used the developed tool is shown in Figure 21 it is found that number of accessing the website was positively correlated to the knowledge score after used the developed tool (r=0.419, P=0.004)

Table 23 Frequency of accessing the website during the study

Frequency of accessing the website	Week 1	Week 2	Week 3	Week 4
Mean	2.6	2.3	2.1	1.8
S.D.	0.97	0.87	0.65	0.69
Minimum	1	1	1	1
Maximum	6	5	3	4

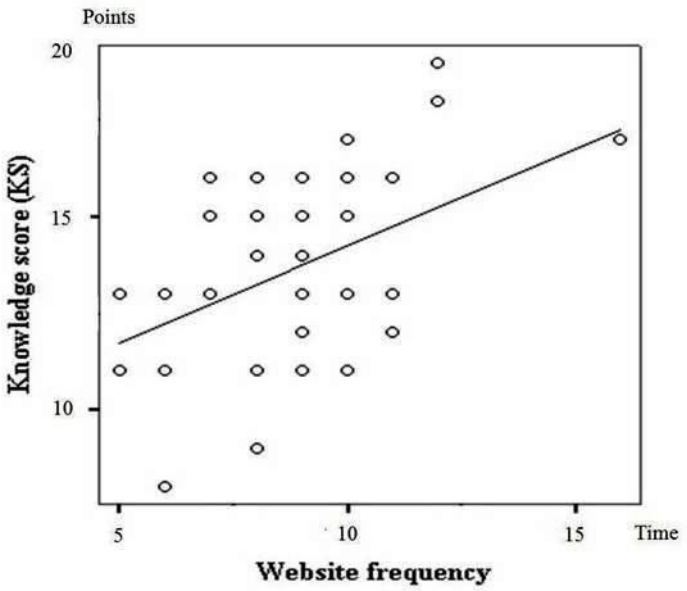

Figure 21 The correlation of accessing the website during the study and knowledge score of all subjects from week 1 to week 4

The record of frequency of accessing the website and classification of knowledge level as shown in Table 24 revealed that 13 subjects (34.21%) who accessed the website over than 3 times a week had scored a high and moderate level of knowledge (53.85% and 46.15% respectively) at post-test whereas 25 subjects who accessed less than 3 times a week had scored a moderate to low level of knowledge (88% and 12% respectively).

Table 24 Frequency of accessing the website and knowledge level

Frequency of accessing the website	Total n (%)	Knowledge level		
		Low n (%)	Moderate n (%)	High n (%)
≥ 3 times/week	13 (34.21%)	0 (0%)	6 (46.15%)	7 (53.85%)
< 3 times/week	25 (65.79%)	3 (12.00%)	22 (88.00%)	0 (0%)

5.2.11 Subject's attitude on hypertension awareness and management

Subjects were assessed for an attitude on hypertension awareness and management by using questionnaire which consisted of 8 positive attitude questions and 7 negative attitude questions. The test was done before and after using the developed tool. The result revealed that there was a significant difference in subject's attitude before and after using the developed tool (Table 25).

Table 25 Subject's attitude on hypertension awareness and management

Attitude level	Pre-test n (%)	Post-test n (%)	P-Value
Poor (average point 0-2.49)	0 (0%)	0 (0%)	0.031*
Fair (average point 2.50-3.49)	18 (47.4%)	7 (18.4 %)	
Good (average point 3.50-5.00)	20 (52.6%)	31 (81.6 %)	

*Significant difference at P-value < 0.05, 95% CI.

5.2.12 Subject's satisfaction with the developed tool.

The subject's satisfaction was obtained from the questionnaire consisted of content aspect, website format, font, illustration, and application programs. The questionnaire was the closed ended questions of rating scale with 4 levels of measurement and the comments from subjects were collected as well. The results of the subjects' response are given in Table 26. Most subjects were satisfied with the overall developed tool. Furthermore, they intended to use this developed tool continuously and interested to learn more about other health and nutrition related disease.

Table 26 Subject's satisfaction with the developed multimedia website tool

Assessment topic	*Opinion				Mean ± S.D.
	4 **n** **(%)**	**3** **n** **(%)**	**2** **n** **(%)**	**1** **n** **(%)**	
1. Content:					
1.1 Content corresponding the objective					
• Understanding the goal of meal planning for diet controlling	13 (34.2)	18 (47.4)	6 (15.8)	1 (2.6)	3.13 ± 0.77
• Understanding the nutrients source which affect the health	13 (34.2)	22 (57.9)	3 (7.9)	-	3.26 ± 0.60
• Understanding the role of sodium in food which affect the blood pressure	10 (26.3)	21 (55.3)	7 (18.4)	-	3.07 ± 0.67
• Understanding the concept of DASH diet	10 (26.3)	20 (52.6)	8 (21.1)	-	3.05 ± 0.70
• Understanding the appropriate amount of food to health in individual	8 (21.1)	20 (52.6)	9 (23.7)	1 (2.6)	2.92 ± 0.74
• Understanding the concept of sodium counting in food using colour dots	5 (13.2)	23 (60.5)	10 (26.3)	-	2.86 ± 0.62

*Opinion; 4 = Very good, 3 =Good, 2 =Fair, 1 = Need improvement

Table 26 Subject's satisfaction with the developed multimedia website tool (Cont.)

Assessment topic	*Opinion				Mean ± S.D.
	4 **n** **(%)**	**3** **n** **(%)**	**2** **n** **(%)**	**1** **n** **(%)**	
• Understanding the amount of food exchange or serving	4 (10.5)	21 (55.3)	9 (23.7)	4 (10.5)	2.65 ± 0.81
• Can count colour dots correctly	3 (7.9)	17 (44.7)	15 (39.4)	3 (7.9)	2.53 ± 0.76
1.2 Appropriate volume content	6 (15.8)	28 (73.7)	4 (10.5)	-	3.05 ± 0.52
1.3 Content not too difficult, easy to understand Presentation not too complicate and easy to understand	11 (28.9)	25 (65.8)	2 (5.3)	-	3.24 ± 0.54
1.4 Presentation not too complicate, and easy to understand	15 (39.4)	20 (52.6)	3 (7.9)	-	3.18 ± 0.56
Total content aspect					**3.00**

*Opinion; 4 = Very good, 3 =Good, 2 =Fair, 1 = Need improvement

Table 26 Subject's satisfaction with the developed multimedia website tool (Cont.)

Assessment topic	*Opinion				Mean ± S.D.
	4 **n** **(%)**	**3** **n** **(%)**	**2** **n** **(%)**	**1** **n** **(%)**	
2. Website format :					
2.1 Website overview	8 (21.1)	26 (68.4)	4 (10.5)	-	3.10 ± 0.55
2.2 Appropriate composition style of pictures and font	6 (15.8)	26 (15.8)	4 (10.5)	2 (5.3)	2.94 ± 0.69
2.3 Attractive colour	8 (21.1)	27 (71.1)	3 (7.9)	-	3.13 ± 0.52
2.4 Easy to use	7 (18.4)	27 (71.1)	4 (10.5)	-	3.07 ± 0.53
2.5 Speed of opening web page	5 (13.2)	23 (60.5)	9 (23.7)	1 (2.6)	2.84 ± 0.67
Total content aspect					**3.01**
3. Font :					
3.2 Appropriate font style	6 (15.8)	27 (71.1)	5 (13.2)	-	3.02 ± 0.54
3.2 Clearly font size	7 (18.4)	28 (73.7)	2 (5.3)	1 (2.6)	3.07 ± 0.58
3.3 Clear words and easy to read	8 (21.1)	25 (65.8)	5 (13.2)	-	3.07 ± 0.58
Total content aspect					**3.05**
4. Illustration					
4.1 Clear pictures and Colourful theme	8 (21.1)	24 (63.2)	5 (13.2)	1 (2.6)	3.03 ± 0.68
4.2 Appropriate size of pictures	6 (15.8)	28 (73.7)	4 (11)	-	3.05 ± 0.52
Total content aspect					**3.04**

*Opinion; 4 = Very good, 3 =Good, 2 =Fair, 1 = Need improvement

Table 26 Subject's satisfaction with the developed multimedia website tool (Cont.)

Assessment topic	*Opinion				Mean ± S.D.
	4 **n** **(%)**	**3** **n** **(%)**	**2** **n** **(%)**	**1** **n** **(%)**	
5. Application programs					
5.1 Easy to use and meet the content	9 (23.7)	22 (57.9)	7 (18.4)	-	3.05 ± 0.65
5.2 Appropriate composition and colourful	6 (15.8)	28 (73.7)	4 (10.5)	-	3.05 ± 0.51
5.3 Total website speed	4 (10.5)	23 (60.5)	7 (18.4)	4 (10.5)	2.71 ± 0.80
Total content aspect 2.93					
Total satisfaction 3.01					

*Opinion; 4 = Very good, 3 =Good, 2 =Fair, 1 = Need improvement

CHAPTER VI
DISCUSSION

The main objectives of the study were to develop and evaluate the effectiveness of a multimedia website nutrition education tool for meal planning in hypertensive subject. The effectiveness of the developed tool was evaluated by assessing the subject's knowledge and satisfaction of the developed tool was also determined. This chapter discussed the results according to the sequence of the study in chapter v.

Phase 1: Development of multimedia website nutrition education tool

6.1 The developed multimedia website tool

The developed education tool was a multimedia website nutrition education tool for meal planning in hypertensive subjects. The purposes to construct a multimedia website were to provide knowledge of hypertension both in prevention and control blood pressure as well as planning appropriate diet and physical activity. The content based on The National High Blood Pressure Education Program (NHBPEP) which is one of the most successful prevention programs [106].

The reason to develop a multimedia website nutrition education tool was due to the web-based nutrition education is more likely to be read, remembered, and experienced as personally relevant compared to general education. This also appears to have a greater impact in motivating people to change their eating behaviour. Moreover, web-based nutrition education can provide benefit to large numbers of subjects at low cost [101,102].

6.1.1 The form of developed multimedia website tool

The content topics were divided into 3 main sections. The first section was "knowledge of hypertension" consisted of 2 videos and 6 topics content. The second section was "self-assessment programs" consisted of 6 self-assessment

application programs which were 1-BMI assessment, 2- meal planning, 1-knowledge testing, and 2-physical activities application programs. The third section was "knowledge of diet and exercise" consisted of 10 topics content. Moreover, it is possible to share experience/opinion between learner and learner or learner and researcher (website administration) via "kindee web-board".

6.1.2 The way of presentation

The study of Anderson MLF [111] reported that the appearance of the tool was thought to be crucial factor in determining whether people read or disposed. Therefore, the multimedia website nutrition education tool was constructed as having readable fonts, relevant colorful illustration in the form of photographs and cartoons as well as colorful website theme for relaxing emotion. According to the previous several studies showed that learner preferred colorful fonts and pictures which is beneficial for learner such as aid memory of information, important for learning and provided a good satisfaction. [107-112].

The knowledge contents were set as sort order step by step to make learner easy to explore the content within each menu. Learners can select the knowledge to study in particular section that they interested as well as test their own knowledge after finished reading the interested section or topic. The knowledge contents were presented as multimedia consisted of text, picture, video clips, and Flash Java application. Similar to previous studies [113,114] which reported that multimedia can be useful to help learners improve knowledge more effectively.

For meal planning which was the prominent point of the developed multimedia website, it started with an application programs on BMI assessment to know their weight status then calculate an appropriate energy requirement including food portion in each food groups. The approach that make multimedia website nutrition education tool different from other general website hypertension education was the dietary assessment program which can assess energy and dietary intake from reliable source of food database [29-31] and also can assess sodium content that influencing on blood pressure using traffic-light concept adopted from Janejob N. [17] to represent the content of sodium in food by presented as 3

colors dot (green as low sodium content, yellow as moderate sodium content, and red as high sodium content).

Using web-board and e-mail to share experience/opinion appears to have compensated for a lack of personal social interaction and resulted in good relationship between learners [115]. Moreover, web-board can be a good quality tool for distance learning equal to or better than face-to-face learning classes [116-123]. This study, researcher used the web-board to and e-mails to provide the information as well as technical problems solving relevant to the developed multimedia website.

As mentioned above, the developed multimedia website was asynchronous learning. Therefore, learners can be studied or explored by themselves, step by step. This has been associated with andragogy theory which stated that adults are self-directed learners participating actively in their own learning [103,104]. This frame work promotes a learner-centered focus in which instructor are guides rather than provides knowledge, and where curricula is designed as experiential education to find meaning in what is learn [105].

Phase 2: Evaluation the effectiveness of the developed multimedia website tool

6.2 Demographic characteristic of the subjects

The evaluation of the effectiveness of a developed multimedia website tool was conducted at Krung Thai Bank Company Limited, Bangkok. Initially 43 subjects were recruited for the study but finally 38 subjects completed the study. The most reason given by the 3 subjects (6.97%) who dropped out of the study was the lack of time while 1 subject (2.32%) had to move to another branch of Krung Thai Bank and 1 subjects (2.32%) had early retirement from her work.

Totally 38 subjects met criteria were recruited for evaluation the effectiveness of a multimedia website. In this study, the proportion of hypertension in male was slightly higher than female (55.3% in male and 44.7% in female). The gender proportion was agreed with the previous studies that reported that the prevalence and incidence of hypertension was higher in men than women [9,124].

The results of this study showed that most of the subjects (92%) aged higher than 41 years. Overall subjects had a mean age of 49.71 ± 6.82 years by the highest number of age group was at 51-60 years (50%) whereas 31-40 years group had only 7.9%. This agreed with the National Health and Nutrition Examination Survey, 1988-1991 by Burt V.L. et al [124] which reported that prevalence of hypertension increased with age, it was about 25% in men age 40-50 years and increased to over 50% after age of 60 years. Most of the subjects were married (79%) and had the education level of bachelor's degree (71%). The majority of the subjects of this study work as state enterprise employees (94.7%) with an average income more than 60,000 baht (55.3%). This result was similar to the studies of Janejob N and Satitpitakul S (17,126) reported that most of the subjects were state enterprise employees and had education level at bachelor's degree. For the using of computer and internet, most of the subjects using everyday with 79% and 57.9% respectively. This result agreed with a survey of information technology and communication within the household in 2006 which reported that 59.51 million people aged over 6 years old, more than 15.39 million people (25.9%) can use computer and 8.47 million people (14.2%) have internet access [22]. Especially among those who use the internet, the majority were found in Bangkok.

6.3 Health information of the study subjects

The health information of this study revealed that half of subjects had hypertension for 1-5 years (52.6%). Half of subjects also had other present illness which were dyslipidemia (23.7%), diabetes (21%), bone disease (5.3%), asthma or allergy (5.3%), and peripheral neuropathy (2.7%). Most of the subjects had a family history of hypertension mainly from parents. This result agreed with the studies of Rose S and Luma GB [128,129] which reported that positive family history was associated with hypertension prevalence double that found in persons with negative history. The JNC 7^{th} [9] reported that hypertensive patients who have at least one cardiovascular risk factor should be received lifestyle modification up to 6 months with blood pressure monitoring. In this study, most of the subjects (92.1%) received a treatment of hypertension. However, only 7.9% did not control blood pressure. The subjects who received a treatment of hypertension, it was found that most subjects

had anti-hypertensive drug, diet control and exercise, and anti-hypertensive drug together with diet control and exercise to control their blood pressure (36.84%, 18.42%, and 13.15% respectively). Furthermore, the JCN 7th [9] reported that cigarette smoking was associated with the increasing in both systolic and diastolic blood pressure. However, in this study found that only 2.7% of subject was a cigarette smoker. The alcohol beverage consumption found that most of subjects were none alcohol drinkers (73.7%) while the rest of subjects who were alcohol drinkers consumed liquor (10.5%), beer (15.8%), and wine (7.9%).

6.4 Basic knowledge on diet and hypertension

Most of the subjects have never been received information on DASH diet or sodium content in foods before (81.6%) as well as the information on food exchange (89.5%). Correspond to the studies of several previous studies [17,126, 127] reported that most of subjects did not have knowledge about sodium in foods or knowledge of that excessive sodium consumption on blood pressure level, and food exchange before. For the subjects who had received information on DASH diet, sodium content in foods, and information on food exchange (10.5%) reported that they had received these information from books, magazines and information board at Krung Thai Bank Clinic Department. This result was different from previous study [127] which reported that the most source of nutrition information was television and the second source was newspaper or magazine.

6.5 Baseline dietary intake of the subjects

The average intake of all subjects was found to be 1,752.39 ± 223.77 kcal and the percentages of energy distribution of carbohydrate, protein, and fat were 60.36%, 12.57%, and 27.08% respectively. The percentage of carbohydrate was slightly higher than the recommendation (60.36%) whereas percentage of protein was lower than the recommendation. The proportion of carbohydrate, protein, and fat of this study was at 60.36%, 12.57%, and 27.08% respectively. The results of this study are associated with the fifth survey on food and nutrition status of Thailand [155] reported that majority of Thais was at the balance diet that was 62.1%, 13.9 %, and 23.9% of carbohydrate, protein, and fat respectively.

The mean cholesterol intake of the subjects was higher than the recommended cholesterol level according to the NCEP ATP III recommendation for lowering cholesterol [153]. For the dietary fiber consumption, it was less than the recommended value from the Thai RDI [154] which recommended 20 to 30 g of dietary fiber per day.

The average sodium intake of subjects was 2,846.82 mg with the highest and lowest of sodium consumption at 3,485 and 1,803.46 mg respectively. Most subjects had excessive sodium intake (86.84%) whereas only 13.2% of subjects was at recommended range of sodium intake which recommended less than 2,400 mg of sodium intake [94]. This associated with the study of Limmanon W [145] reported that mean of sodium intake of hypertensive subjects aged 20-60 years was 2,908 mg per day. The finding indicated that all subjects consumed sodium above the recommendation with no more than 2,400 mg per day (6 g of sodium chloride) according to the JNC 7^{th} for prevention and control hypertension [9].

The results also showed that potassium and calcium intake of the subjects were lower than the recommended values. These results identified that their dietary consumption was not met the concept of Dietary Approach to Stop Hypertension or DASH diet guideline for lowering blood pressure. A study of effects on blood pressure of reduced dietary sodium and the Dietary Approach to Stop Hypertension (DASH) by Frank M Snacks et al [16] reported that consumed the DASH diet, systolic blood pressure fell by 11.4 mm Hg more than the blood pressures of subjects who remained on the standard American control diet and it was even more effective when accompanied by lower sodium intakes. Sodium restriction by itself may have modest blood pressure-lowering effect, but some people are more responsive than others. However, reduced sodium diet is typically recommended for all people with hypertension, but it should be combined with other lifestyle modifications for greater effect.

6.6 The anthropometric data and blood pressure of subjects

The results of this study found that more than a half of subjects (42.1%) was obese (body mass index greater than 25 kg/m^2) with average mean 27.85 kg/m^2 as well as the waist circumference of total 38 subjects was higher cut off level (81.57%)

of waist circumference. There is a strong association between BMI and hypertension among men and women in all race or ethnic groups. The study of BMI and the incidence of the metabolic syndrome by Feng-Yu [132] reported that BMI showed a dose- response association with increased risk of the incident of metabolic syndrome, and the hazard ratio for BMI above 25 kg/m^2 versus BMI range 18-22.9 kg/m^2 was 5.00 (95% CI: 4.18-5.98) in men and 5.48 (95% CI: 4.32-6.95) in women. In the studies of Haslam DW and Wofford MR [130,131] reported the excessive bodyweight is the most important risk factor contributing to the overall burden of disease worldwide 1.1 billion adults. The main adverse consequences are hypertension, cardiovascular disease, type 2 diabetes, and several types of cancers which more than 85% of hypertensive persons occur in those with a body mass index greater than 25 kg/m^2.

Moreover, several previous studies reported that people with higher BMI or waist circumference (WC) had been found to have an increased risk of high hypertension, high fasting plasma glucose, dyslipidemia, and a high probability of health benefit from WC or BMI reduction with improved metabolic syndrome and reduction in cardiovascular risk factors [133-135].

The study of health and quality of life in people with large waist circumference by Lean MEJ [136] showed that larger waist circumference identifies people at increased cardiovascular risks. Moreover, it is well known that there is a relationship between the increase in abdominal adipose tissue and rise in blood pressure [137,138].

Total 38 subjects, there was pre-hypertension a half of subjects (50%) had systolic blood pressure between 120-139 mmHg whereas systolic blood pressure greater than or equal to 140 mmHg was at 26.31%. Total 26 subjects who receiving anti-hypertensive drug showed that majority of the subjects had blood pressure between 120-139 of systolic blood pressure. Total 12 subjects who were not receiving anti-hypertensive drug shown that more than a half of subjects had systolic and diastolic blood pressure that was between 120-139 with the mean of blood pressure at 130.50 ± 5.02 mmHg of systolic blood pressure. From the subject's health information of this study revealed that more than a half (68.4%) treated hypertension by receiving anti-hypertensive drugs. This result showed that most subjects were

getting their blood pressure treatment. The nutrition education intervention using the developed website tool should be conducted to those groups of subjects to reduce complication from hypertension. The study of Web-based Nutrition Education Program (DASH for Health) by Moore TJ et al. [152] revealed that continued use of a nutrition education program delivered totally via the internet, with no person-to-person contact with health professionals is associated with significant weight loss, blood pressure lowering, and dietary improvements after 12 months.

6.7 Subject's knowledge and understanding of meal planning using DASH diet and sodium traffic-light concept

6.7.1 Subject's knowledge and understanding of meal planning using DASH diet and sodium traffic-light concept: Before and after using the developed multimedia website tool (Pre-test vs. Post-test)

The results of this study show that before using the developed multimedia website tool (Pre-test at week 0), most of the subjects who took part in the study had low and moderate knowledge level (44.73% and 42.11% respectively) whereas most of the subject's knowledge level improved significantly after using the developed tool (Post-test at week 5) which was at moderate and high level (50% and 42.11% respectively) whereas the rest of subjects (7.89%, only 3 subjects) had low knowledge level. A comparison of pre-test and post-test scores revealed that this increase in the knowledge level was significantly difference between this two tests ($p<0.001$) in the learning effects of this educational multimedia website.

The improvement of knowledge level was similar to several previous studies [17,140,142] which showed that after using the nutrition educational tool, most of the subjects had improved their knowledge level. The study of Chaturawit C [142] which developed an educational tool for self-help meal planning. It was found that most subjects had moderate level in Pre-test knowledge of carbohydrate counting and mostly had high level for the Post-test after using the developed educational tools. There were significant different between the subject's knowledge score ($p<0.05$) when compared the score of subject's knowledge at Pre-test and Post-test.

The significant improvement of knowledge scores of this study was similar to the study of Castro H et al. [144] which compared the efficacy of web-based computer-assisted education (CO-ED) system versus searching the internet for learning about hypertension. It was found that subject age 45 years above who used a web-based computer-assisted education had a statistically significant 15% increase of knowledge score from the baseline knowledge ($p<0.005$) while knowledge scores of subjects searching the internet at "www.yahoo.com" for information about hypertension increased only 0.8%.

Moreover, the results of this study found that there were no correlation between knowledge level after using the developed multimedia website tool and gender, age, and education level. These findings was similar to a study by Janejob N [17] whereas the knowledge level of the subjects improved significantly but no correlation between knowledge level after using a developed tool and those variations.

In contrast with Saenkhum E [141] who developed video tape and pamphlet for educate producer officer in the cottage industry. It was reported that subjects who had higher educational background, could understand the critical information clearly than the subjects who had lower educational background. However, this study found that there was no variation in education level of subjects. The majority of subject's educational level was bachelor's degree (71%) which showed no correlation between subject's knowledge levels after used the developed tool and education level. However, Palloff and Pratt [143] suggested that not all learners may be suited to online learning. In fact, some may be better suited to online learning formats, and others may prefer a face-to-face and online blended delivery structure.

6.7.2 Subject's knowledge and understanding of meal planning using DASH diet and sodium traffic-light concept: Assignment during the study at week 0 to week 4

In order to encourage subjects to learn and practice the knowledge content of the developed multimedia website tool, a multiple choice questionnaire was sent to subject via an inter-link of a multimedia website in different topics at the end of each week. The results of this assignment questionnaire were an

indication on how well the subjects could use and understand the developed multimedia website correctly.

On week 1; "General knowledge of hypertension", found that most of the subjects had moderate to high level of knowledge (52.63% and 47.36% respectively). On week 2; "Meal planning technique", half of subjects had moderate level of knowledge (50.00%) while 4 and 15 subjects had high and low level of knowledge (39.47% and 10.52% respectively). On week 3; "Nutrition label and food exchange", more than a half of subjects had moderate level of knowledge (68.42%) while 7 and 5 subjects had high and low level of knowledge (18.42% and 13.15% respectively). The final assignment on week 4; "Exercise and physical activities for hypertension", most subjects had moderate to high level of knowledge (44.73% and 50% respectively) while only 2 subjects (5.26%) had low level of knowledge.

6.7.3 Frequency of accessing the website and knowledge level

The recorded of frequency of accessing the website and classification of knowledge level. The results indicated that subjects who accessed the website more than 3 times a week had moderate to high level of knowledge whereas subjects who accessed the website less than 3 times a week have low to moderate level of knowledge. This seemed to be that the more the subjects accessing the website, the more they get a better level of knowledge.

6.8 Subject's attitude on hypertension awareness and management

This study found the improvement of a subject's knowledge level in short-term after learning from a multimedia website nutrition education tool. However, the effect of the developed multimedia website tool was measured before and after learning both in pre-hypertensive and hypertensive subjects to determine the change of the attitude on hypertension awareness and management. The results revealed the significant difference between the baseline attitude and after learning from the developed tool ($p<0.05$). At baseline (pre-test attitude), the result showed that half of subjects had fair attitude level (47.4%) whereas post-test attitude, most subjects had good attitude level (81.6%). In addition, regarding the relevant factors that involves the subject's attitude towards hypertension awareness and management, the attitude

test found no correlation between post-attitude test and related factors such as gender, age, and education level.

Correspond to the previous study of Oenema et al [146] which study on the effects of web-based nutrition education interventions. The results showed the changes in a relevant factors number of nutrition behaviours, such as awareness of inappropriate intake levels and motivation to make dietary changes. At present, web-based computer-tailored nutrition education is often closely tailored to motivational factors such as health beliefs and stages of change [147], attitudes and self-efficacy [148]. The evidence revealed such interventions can increase motivation and intentions which almost certainly results in lack of behavior change. Although intention is an important predictor of behavior which lack, a positive intention is no guarantee for behavior change [149]. However, web-based learning could also be applied to help learners to become more aware of the opportunities for healthier eating, for example by providing web-based information for healthy foods choices etc.

6.9 Satisfaction with the developed multimedia website

Satisfaction of content aspect, website format, font, illustration, and application programs of the multimedia website was determined by using rating scale with 4 levels of measurement including need improvement, fair, good, and very good. According to the satisfaction questionnaire, mean scores of the content aspect, mean score was 3.00, it was assessed to be good. A few subjects had suggested that knowledge content on the food exchange was need improvement. This part was similar to the study of Janejob N [17] reported that the satisfaction of the developed educational tool in the part of understanding of food exchange lists for estimate amount of foods was assessed to be need improvement. However, most subjects were satisfied with the overall developed tool.

About the aspects of website format, font and illustration, mean score were 3.01, 3.05, and 3.04 respectively. It was indicated that a multimedia website nutrition education tool had a good website format, font and illustration. This result was agreed with the study of Wibunrattanasiri N [110] who developed the self-help guidelines for meal planning using carbohydrate counting reported most of the participants preferred color in both fonts and illustrations. The colorful presented found the positive in

understanding and remembering easier. This also supported by the results of Anderson et al [150] which revealed that format planned to please target readers and got better the acceptability, since design was one of a crucial factor in determining whether resources were read or were disposed off by the reader.

The last part of the satisfaction assessment was applications program aspect which the mean score was 2.93. It was indicated that a developed tool had fair application programs. Most subjects satisfied with the application programs that was easy to use, meet the content, and colourful. Some of subjects suggested that speed of accessing the website was not fast. The result of this part was agreed with the study of Sekikawa A et al [151] which concluded that download speed was important to learners' satisfaction as content.

Finally, the results of this study indicated that the developed multimedia website nutrition education tool is acceptable as attractive learning tool. One of the effectiveness of this developed tool was a good website format, font, and illustration which was colorful including the application programs that not difficult to use. This would have many benefits as a well informed learner is likely to be less anxious and relax. Furthermore, they intend to use this developed multimedia website nutrition education tool continuously and interest to learn more about other health and nutrition related disease.

CHAPTER VII
CONCLUSION

The purpose of this study was to develop a multimedia website nutrition education tool for meal planning in hypertensive subjects using concept of Dietary Approach to Stop Hypertension (DASH diet) and concept of sodium traffic-light. The evaluation was done to determine the effectiveness of the developed multimedia website tool in term of knowledge and attitude improvement. The subject's satisfaction with the developed multimedia website was also assessed.

The multimedia website nutrition education tool named "www.kindee-jaidee.com" was developed according to the main purpose. The website content topics consisted of general knowledge of hypertension, food and nutrition management based on concept of DASH diet and sodium traffic-light, knowledge, knowledge of exercise for hypertensive person, videos of hypertension, food photo gallery, application programs which were body mass index assessment, energy and nutrients assessment program for meal planning, food intake assessment and record, physical activities and heart rate assessment including basic test of hypertension knowledge and relaxing music. The menu named Health discussion was used for provision nutrition information of hypertension and other nutrition related disease by researcher to learners and encouraging members of kindee-jaidee.com by sharing their experiences as well as the option to contact with researcher.

Total 38 subjects were participated the study to assess the effectiveness of the developed multimedia website for four weeks in terms of knowledge, attitude, and satisfaction, anthropometric parameters, dietary intake, and blood pressure. Majority of the subjects had moderate to high level of knowledge which improved significantly from the baseline after self-learning via the developed multimedia website nutrition education tool. The anthropometric data on BMI, waist circumference, percentage of the body fat including visceral fat of subjects had higher than the normal criteria.

Carbohydrate, protein, and fat distribution of the subjects was in the recommendation but the dietary factors relevant to the blood pressure control such as dietary fiber, cholesterol, especially sodium, potassium, and calcium does not meet the recommendation for controlling hypertension. The attitude on hypertension awareness and management of most subjects was found to be good attitude level improved from fair attitude level at the baseline. Most subjects were satisfied with the developed multimedia website nutrition education tool in providing benefit in term of knowledge and understanding. They also suggested that they would like the multimedia website nutrition education to be released to the public.

Recommendations for further study

The multimedia website nutrition education intervention should be conducted to study the effectiveness of the multimedia website tool on the change of blood pressure, anthropometric parameters, dietary intake as well as the physical activities.

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155. รายงานการสำรวจภาวะอาหารและโภชนาการของประเทศไทย ครั้งที่ 5 พ.ศ. 2546. กองโภชนาการ, กรมอนามัย, กระทรวงสาธารณะสุข 2549.

APPENDICES

APPENDIX A

Documentary proof of ethical clearance committee on human rights related to researches involving human subjects

COA. No. MU-IRB 2010/027.1901

Documentary Proof of Mahidol University Institutional Review Board

Title of Project. Development of Multimedia Website Nutrition Education Tool for Meal Planning in Hypertensive Subjects (Thesis for Master Degree)

Principle Investigator. Mr. Traipop Meechai

Name of Institution. Institute of Nutrition

Approval includes. Annual Report version received date 18 January 2010

Mahidol University Institutional Review Board is in full compliance with International Guidelines for Human Research Protection such as Declaration of Helsinki, The Belmont Report, CIOMS Guidelines and the International Conference on Harmonization in Good Clinical Practice (ICH-GCP)

Date of Renewal (1st). 19 January 2010

Date of Expiration. 18 January 2011

Signature of Chairman. .....
(Professor Shusee Visalyaputra)

Signature of Head of the Institute. .....
(Associate Professor Sansanee Chaiyaroj)
Vice President for Research and Academic Affairs

Office of the President, Mahidol University, 999 Phuttamonthon 4 Rd., Salaya, Phuttamonthon District, Nakhon Pathom 73170. Tel. (662) 8496223-5 Fax. (662) 8496223

APPENDIX B

<u>แบบสอบถาม</u>

<u>โครงการวิจัยวิทยานิพนธ์</u> การพัฒนาเครื่องมือสื่อการสอนทางโภชนาการผ่านระบบมัลติมีเดีย เว็บไซต์ สำหรับการวางแผนการบริโภคอาหาร ในผู้ที่มีความดันโลหิตสูง

<u>วัตุประสงค์</u> เพื่อประเมินคุณภาพของเครื่องมือสื่อการสอนทางโภชนาการผ่านระบบมัลติมีเดีย เว็บไซต์ สำหรับการวางแผนการบริโภคอาหาร ในผู้ที่มีความดันโลหิตสูง

<u>คำชี้แจง</u> แบบสอบถามนี้เป็นการวิจัยเพื่อพัฒนาสื่อการสอนทางโภชนาการ ซึ่งเป็นส่วนหนึ่งของวิทยานิพนธ์ของ นาย ไตรภพ มีชัย นักศึกษาปริญญาโท สาขา อาหารและโภชนาการเพื่อการพัฒนา แขนงวิชา โภชนาการเพื่อการป้องกันและบำบัด สถาบันวิจัยโภชนาการ มหาวิทยาลัยมหิดล

แบบสอบถามนี้ ประกอบด้วย 3 ส่วน ดังนี้

<u>ส่วนที่ 1</u> ข้อมูลทั่วไป

<u>ส่วนที่ 2</u> ข้อมูลสุขภาพ

<u>ส่วนที่ 3</u> ข้อมูลการรับประทานอาหารย้อนหลัง จำนวน 3 วัน

กรุณากรอกข้อมูลลงในแบบสอบถาม โดยเติมคำลงในช่องว่าง หรือทำเครื่องหมาย **(✓)** ลงในช่องที่ตรงกับท่าน โดยข้อมูลที่ได้จากแบบสอบถามนี้ ผู้วิจัยจะเก็บรักษาไว้เป็น ความลับ และขอรับรองว่าจะไม่มีการเปิดเผยข้อมูลนี้แก่ผู้อื่นที่ไม่เกี่ยวข้องกับการวิจัย แต่อย่างใด จะนำไปใช้ประโยชน์ตามวัตถุประสงค์ของการวิจัยในครั้งนี้เท่านั้น

ขอบพระคุณทุกท่านที่กรุณาสละเวลาในการตอบแบบสอบถาม

นาย ไตรภพ มีชัย

ผู้ทำวิจัย

<u>ส่วนที่ 1</u> ข้อมูลทั่วไปของผู้เข้าร่วมโครงการ

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1. เพศ (__) ชาย (__) หญิง

2. อายุ _____ ปี

3. สถานภาพการสมรส (__) โสด (__) สมรส (__) แยกกันอยู่

4. ระดับการศึกษา

(__) ประถมศึกษา (__) มัธยมศึกษาตอนต้น

(__) มัธยมศึกษาตอนปลาย /ปวช. (__) ปวส. / อนุปริญญา

(__) ปริญญาตรี (__) สูงกว่าปริญญาตรี

5. อาชีพ

(__) พนักงานบริษัทเอกชน (__) พนักงานรัฐวิสาหกิจ

(__) รับราชการ (__) ประกอบธุรกิจส่วนตัว/เจ้าของกิจการ

(__) พ่อบ้าน/แม่บ้าน (__) อื่นๆ โปรดระบุ _____

6. รายได้เฉลี่ย (ต่อเดือน) ของผู้เข้าร่วมโครงการ (ทุกที่มาของรายได้ ในหน่วย บาท /เดือน)

(__) < 10,000 (__) 10,000-19,999

(__) 20,000-39,999 (__) 40,000-59,999

(__) > 60,000

7. ท่านใช้คอมพิวเตอร์บ่อยเพียงใด

(__) < 1 ครั้ง ต่อสัปดาห์ (__) 2-3 ครั้ง ต่อสัปดาห์

(__) 3-5 ครั้งต่อสัปดาห์ (__) ทุกวัน

(__) อื่นๆ โปรดระบุ _____

8. ท่านใช้อินเตอร์เน็ตบ่อยเพียงใด

(__) < 1 ครั้ง ต่อสัปดาห์ (__) 2-3 ครั้ง ต่อสัปดาห์

(__) 3-5 ครั้งต่อสัปดาห์ (__) ทุกวัน

(__) อื่นๆ โปรดระบุ _____

<u>ส่วนที่ 2</u> ข้อมูลสุขภาพ

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9. ท่านสูบบุหรี่หรือไม่ (__) ไม่สูบบุหรี่

(__) สูบบุหรี่ เป็นจำนวน _____ (ระบุหน่วย) ต่อวัน

10. เครื่องดื่มแอลกอฮอล์ (__) ไม่ดื่มแอลกอฮอล์

(__) ดื่มแอลกอฮอล์

ประเภท สุรา _____ (ระบุหน่วย) ต่อวัน

เบียร์ _____ (ระบุหน่วย) ต่อวัน

ไวน์ _____ (ระบุหน่วย) ต่อวัน

วิสกี้ _____ (ระบุหน่วย) ต่อวัน

บรั่นดี _____ (ระบุหน่วย) ต่อวัน

11. ท่านควบคุมน้ำหนักตัวหรือไม่ (__) ไม่ควบคุม

(__) ควบคุม ด้วยวิธี (ระบุ) _____

12. ถ้ามีความดันโลหิตสูง ท่านรักษาด้วยวิธีใด

(__) ไม่ได้รักษา

(__) รักษาด้วยวิธี (ตอบได้มากกว่า 1 ข้อ)

(__) ควบคุมอาหาร

(__) ออกกำลังกาย

(__) ใช้ยารักษา

(__) อื่นๆ (ระบุ) _____

13. ในครอบครัวของท่าน มีผู้ที่มีภาวะความดันโลหิตสูงหรือไม่

(__) ไม่มี

(__) มี (ตอบได้มากกว่า1 ข้อ)

(__) พ่อ / แม่ (__) สามี / ภรรยา (__) บุตร

(__) พี่ / น้อง (__) อื่นๆ (ระบุ) _____

14. นอกจากความดันโลหิตสูง ท่านมีโรคประจำตัวอื่นหรือไม่

(__) ไม่มี

(__) มี (ตอบได้มากกว่า 1 ข้อ)

(__) เบาหวาน (__) ไขมันในเลือดสูง

(__) โรคหัวใจ (__) โรคกระดูก

(__) โรคไต (__) อื่นๆ (ระบุ) _____

15. ท่านเคยได้รับความรู้ในการวางแผนการบริโภคอาหารเพื่อควบคุมความดันโลหิตสูงด้วยวิธี แดช ไดเอ็ท (DASH diet) หรือ การนับปริมาณโซเดียมในอาหารมาก่อนหรือไม่ ถ้าเคย ท่านได้รับความรู้จากแหล่งใด

(__) ไม่เคย

(__) เคย โดยได้รับความรู้จาก (ตอบได้มากกว่า 1 ข้อ)

(__) สื่อสิ่งพิมพ์ /วารสาร /นิตยสาร

(__) วิทยุ

(__) โทรทัศน์

(__) อินเตอร์เน็ต

(__) เพื่อน / ญาติ

(__) อื่นๆ (ระบุ) _____

16. ได้รับความรู้เรื่องสัดส่วนอาหาร รายการอาหารแลกเปลี่ยนมาก่อนหรือไม่ ถ้าเคย ท่านได้รับความรู้จากแหล่งใด

(__) ไม่เคย

(__) เคย โดยได้รับความรู้จาก (ตอบได้มากกว่า 1 ข้อ)

(__) สื่อสิ่งพิมพ์ /วารสาร /นิตยสาร

(__) วิทยุ

(__) โทรทัศน์

(__) อินเตอร์เน็ต

(__) เพื่อน / ญาติ

(__) อื่นๆ (ระบุ) _____

<u>ส่วนที่ 3</u> ข้อมูลการรับประทานอาหารย้อนหลัง จำนวน 3 วัน

<u>ข้อแนะนำในการบันทึก</u>

1. บันทึกอาหารทุกชนิดรวมทั้งขนมและเครื่องดื่มที่รับประทานตลอดทั้งวัน ตั้งแต่ท่านตื่นนอนจนเข้านอน **<u>(เฉพาะส่วนที่ท่านรับประทาน)</u>**
2. บันทึกอาหารที่รับประทานทั้งที่บ้านและนอกบ้าน
3. บันทึกรายการอาหาร 3 วัน ประกอบด้วย 2 วันธรรมดา และ 1 วันหยุด
4. ข้อความต่อไปนี้เป็นสิ่งจำเป็นในการบันทึก
    ก. ระบุเครื่องประกอบของอาหารแต่ละชนิด พร้อมทั้งปริมาตร โดยของแข็งให้ระบุเป็นช้อนตวงหรือทัพพี ส่วนประกอบของเหลวระบุปริมาตรเป็น ซี.ซี. หรือระบุตามที่ ตวง-วัด ที่ใช้อยู่ในบ้าน ถ้าไม่สามารถประมาณปริมาณได้ ให้พยายามบันทึก ในรูปขนาดแทน เช่นขนาดเล็ก กลาง ใหญ่ หรือขนาดกว้าง ยาว ของอาหารที่ใช้เช่น ผัดเปรี้ยวหวาน ต้องระบุว่ารับประทานแตงกวาประมาณ 4 ช้อนโต๊ะ (หรือ 1 ทัพพี) มะเขือเทศ 2 ช้อนโต๊ะ เนื้อหมู 5 ชิ้นขนาดชิ้นละ 1x2 ซ.ม. เครื่องดื่มควรระบุเป็นปริมาณเป็นปริมาตรหรือขนาดเช่น น้ำอัดลม 1 กระป๋อง หรือ 325 ซี.ซี. เป็นต้น
    ข. อาหารที่รับประทานปรุงอย่างไร เช่นปลาทูทอด ไก่ย่าง เป็นต้น
    ค. การเติมน้ำตาล น้ำเชื่อม เกลือ ซอสปรุงรส หรือน้ำปลา ลงในเครื่องดื่ม อาหาร ของหวานชนิดต่างๆให้ระบุปริมาณด้วยเช่น น้ำตาล 2 ช้อนชา ในกาแฟ 1 แก้ว

<u>ตัวอย่างการบันทึกอาหาร</u>

<u>แบบบันทึกรายการอาหารที่รับประทาน จำนวน 3 วัน</u>

วันที่ <u>จันทร์ ที่ 21 กันยายน 2552</u>

มื้ออาหาร และสถานที่	**เวลา**	**ประเภท**	**ส่วนประกอบอาหาร**	**ปริมาณ**
เช้า	7.00 น.	ขนมปังทาแยม	ขนมปัง	2 แผ่น
ที่บ้าน			แยมสตรอเบอรี่	2 ช้อนโต๊ะ
		ไข่ดาว	ไข่ไก่	1 ฟอง
		กาแฟ	กาแฟ	1 ช้อนชา
			ครีมเทียม	2 ช้อนชา
			น้ำตาล	2 ช้อนชา
เที่ยง	12.10 น.	บะหมี่น้ำ	บะหมี่	2 ก้อน
ที่ทำงาน			หมูสับ	2 ช้อนโต๊ะ
			ลูกชิ้น	2 ลูก
			กระเทียมเจียว	1 ช้อนโต๊ะ
			น้ำตาล	2 ช้อนชา
		เปปซี่	เปปซี่ กระป๋อง	1 กระป๋อง, 325 cc.
อาหารว่าง	14.30 น.	ฝรั่ง	ฝรั่ง	1 ผลกลาง
ที่ทำงาน		สัปปะรด	สัปปะรด ขนาด 5 x 13 ซม.	1 ชิ้น
			เกลือ+น้ำตาล	2 ช้อนโต๊ะ
เย็น	18.30 น.	ข้าวกระเพราไก่	ข้าวสวย	3 ทัพพี
ที่บ้าน			เนื้อไก่สับ	2 ช้อนโต๊ะ
		ไข่ดาว	ไข่ไก่	1 ฟอง
			น้ำมันรำข้าว	3 ช้อนโต๊ะ
		นม	นพร่องมันเนย	1 กล่อง, 250 cc.

<u>คำแนะนำ:</u> แถบสเกล สำหรับเปรียบเทียบขนาด (กว้าง-ยาว) หน่วยเป็น ซม. โดยเทียบช่องละ 1 เซนติเมตร จากขอบทั้ง 2 ขอบของอาหารชิ้นนั้น

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

<u>แบบบันทึกอาหารที่รับประทานใน 24 ชั่วโมง</u>

วันที่ _____

มื้ออาหาร และสถานที่	**เวลา**	**ประเภท**	**อาหาร**	**ปริมาณ**

<u>คำแนะนำ:</u> แถบสเกล สำหรับเปรียบเทียบขนาด (กว้าง-ยาว) หน่วยเป็น ซม. โดยเทียบช่องละ 1เซนติเมตร จากขอบทั้ง 2 ขอบของอาหารชิ้นนั้น

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

<u>แบบประเมินทัศนคติในการตระหนักและการจัดการความดันโลหิตสูง (1/2)</u>

โปรดกาเครื่องหมาย ✓ ลงในช่องว่างของแต่ละข้อความที่ตรงกับระดับของความคิดเห็นของท่าน

ลำดับที่	ข้อความ	ระดับความคิดเห็น				
		เห็นด้วยอย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็นด้วย	ไม่เห็นด้วยอย่างยิ่ง
1.	ความดันโลหิตสูงไม่ใช่โรคที่ควรระวังมากนัก					
2.	หากพบว่ามีความดันโลหิตสูงกว่าปกติเล็กน้อย ก็มิได้กังวลมากนัก					
3.	การรับประทานยาลดความดัน ช่วยให้สะดวก และง่ายในการคุมความดันโลหิตสูง					
4.	รู้สึกอายเมื่อผู้อื่นทราบผลการวัดความดัน หรือตรวจการสุขภาพ					
5.	เมื่อเป็นความดันโลหิตสูงแล้ว ก็มิได้วิตกกังวลใดๆ เนื่องจากใครๆ ก็เป็นกัน					
6.	เกิดความรู้สึกลำบากใจ เมื่อต้องปรับเปลี่ยนรูปแบบการดำเนินชีวิต ซึ่งขัดกับความชอบ หรือสิ่งที่กระทำโดยปกติ เคยชิน					
7.	การเรียนรู้ ค้นคว้าหาข้อมูลจากอินเตอร์เน็ต ใช้งานยาก ไม่ถนัด					
8.	ความรู้ในเรื่องอาหารและโภชนาการในเว็บไซต์ต่างๆ สามารถเชื่อถือได้ และนำไปใช้ได้เลย					

<u>แบบประเมินทัศนคติในการตระหนักและการจัดการความดันโลหิตสูง (2/2)</u>

โปรดกาเครื่องหมาย ✓ ลงในช่องว่างของแต่ละข้อความที่ตรงกับระดับของความคิดเห็นของท่าน

ลำดับที่	ข้อความ	ระดับความคิดเห็น				
		เห็นด้วยอย่างยิ่ง	เห็นด้วย	ไม่แน่ใจ	ไม่เห็นด้วย	ไม่เห็นด้วยอย่างยิ่ง
9.	ข้าพเจ้ารู้สึกยินดีที่จะเรียนรู้ผ่านสื่อในรูปแบบที่ไม่คุ้นเคย					
10.	การได้รับยา ร่วมกับการปรับเปลี่ยนพฤติกรรมการบริโภคอาหารและการออกกำลังกาย สามารถคุมความดันได้ดีกว่าการได้รับยาเพียงอย่างเดียว					
11.	การควบคุมปริมาณโซเดียมในอาหาร จะสามารถช่วยควบคุมความดันโลหิตได้					
12.	การที่มีเทคนิคช่วยในการคุมปริมาณโซเดียมในอาหาร ช่วยให้เกิดความง่ายในการเลือกบริโภค					
13.	ถ้าไม่ลืม ข้าพเจ้าจะหลีกเลี่ยงการเติมเครื่องปรุง เครื่องจิ้มเพิ่ม					
14.	ข้าพเจ้าสามารถนำเอาความรู้ที่มี ไปประยุกต์ใช้ให้เกิดประโยชน์ต่อสุขภาพได้					

APPENDIX C

แบบประเมินผลก่อนและหลังใช้เครื่องมือสื่อการสอนทางโภชนาการ

แบบประเมินผลนี้ เป็นการประเมินความรู้และความเข้าใจ ก่อนและหลังใช้เครื่องมือสื่อการสอนทางโภชนาการ โดยการประเมินมีทั้งหมด 20 ข้อ แบ่งออกเป็น 2 ตอน แบบปรนัย จำนวน 15 ข้อ และ เติมเครื่องหมายถูก (✓) หรือ เครื่องหมายผิด (X) จำนวน 5 ข้อ

ตอนที่ 1 คำถามปรนัย

คำชี้แจง ทำเครื่องหมาย X ลงบนคำตอบที่ถูกที่สุด

1. ค่าความดันในข้อใด จัดว่ามีความดันโลหิตปกติ
   ก. น้อยกว่า 120 / 80 มิลลิเมตรปรอท
   ข. น้อยกว่า 130 / 80 มิลลิเมตรปรอท
   ค. น้อยกว่า 140 / 80 มิลลิเมตรปรอท
   ง. น้อยกว่า 140 / 90 มิลลิเมตรปรอท

2. ข้อใดคือปัจจัยที่สามารถทำให้เกิดภาวะความดันโลหิตสูง
   ก. น้ำหนักเกิน พักผ่อนน้อย
   ข. ความเครียด การขาดการออกกำลังกาย
   ค. การบริโภคอาหารไม่ถูกหลัก
   ง. ถูกทุกข้อ

3. ข้อใดต่อไปนี้เป็นอาการที่สามารถรู้สึกได้ด้วยตนเอง เมื่อมีภาวะความดันโลหิตสูง
   ก. ปวด มึนศรีษะ หูอื้อ ตาลาย
   ข. กระเพาะอาหาร ลำไส้ ทำงานผิดปกติ
   ค. หิว ดื่มน้ำ และปวดปัสสาวะบ่อย
   ง. ปวดเมื่อยตามข้อ และร่างกาย

4. ข้อใด **ไม่ใช่** โรคแทรกซ้อนที่จะเกิดขึ้นจากภาวะความดันโลหิตสูง
   ก. โรคไต
   ข. โรคข้อและกระดูก
   ค. อัมพาต
   ง. เส้นเลือดในสมองแตก

5. Aerobic exercise (การออกกำลังกายแบบแอโรบิค) ประกอบด้วยสิ่งใด
   ก. ความถี่ ความหนัก ระยะเวลา ประเภทของการออกกำลังกาย
   ข. ความถี่ ความหนักของการออกกำลังกาย
   ค. ความถี่ ระยะเวลาของการออกกำลังกาย
   ง. ความหนัก ระยะเวลา ประเภทของการออกกำลังกาย

6. ผู้ที่มีความดันโลหิตเท่าใด ที่ **ควรงด** การออกกำลังกาย
   ก. สูงกว่า 150 / 85 มม.ปรอท
   ข. สูงกว่า 160 / 85 มม.ปรอท
   ค. สูงกว่า 170 / 90 มม.ปรอท
   ง. สูงกว่า 180 / 100 มม.ปรอท

7. ข้อใด **ไม่ใช่** แนวทางในการปรับเปลี่ยนพฤติกรรมเพื่อควบคุมภาวะความดันโลหิตสูง
   ก. การออกกำลังกาย ลดน้ำหนัก ลดการบริโภคอาหารที่มีรสเค็ม
   ข. หลีกเลี่ยงการรับประทานอาหารซึ่งปรุงด้วยวิธีทอด
   ค. หลีกเลี่ยงการรับประทานอาหารที่มีรสเผ็ดจัด
   ง. ลดการบริโภคเครื่องดื่มที่มีแอลกอฮอล์ เพิ่มการบริโภคผัก ผลไม้ และนมไขมันต่ำ

8. ปริมาณโซเดียมที่เหมาะสมในการบริโภคต่อวันคือข้อใด
   ก. ไม่เกิน 2,400 มิลลิกรัม หรือประมาณเกลือแกง 1 ช้อนชา
   ข. ไม่เกิน 2,400 มิลลิกรัม หรือประมาณเกลือแกง 1 ช้อนโต๊ะ
   ค. ไม่เกิน 3,000 มิลลิกรัม หรือประมาณเกลือแกง 1 ช้อนชา
   ง. ไม่เกิน 3,000 มิลลิกรัม หรือประมาณเกลือแกง 1 ช้อนโต๊ะ

9. หน่วยของปริมาณอาหารในหมวดอาหารแลกเปลี่ยน คือข้อใด
   ก. ช้อนโต๊ะ
   ข. ทัพพี
   ค. กรัม
   ง. ส่วน

10. การควบคุมความดันโลหิตสูง เพื่อให้ได้ผลดีที่สุด เน้นการบริโภคอาหารแบบใด
   ก. ลดโซเดียม เพิ่มผัก ข้าวกล้อง และผลไม้
   ข. ลดโซเดียม เพิ่มผัก ผลไม้ และนม รวมถึงผลิตภัณฑ์จากนม
   ค. เพิ่มโซเดียม เพิ่มผัก ข้าวกล้อง และผลไม้
   ง. เพิ่มโซเดียม เพิ่มผัก ผลไม้ และนม รวมถึงผลิตภัณฑ์จากนม

11. หนึ่งส่วนอาหารแลกเปลี่ยน" หมายถึงข้อใด
   ก. อาหารที่อยู่ในหมวดเดียวกัน มีปริมาณสารอาหารที่แตกต่างกัน แต่พลังงานใกล้เคียงกัน
   ข. อาหารที่อยู่ในหมวดเดียวกัน มีปริมาณสารอาหารใกล้เคียงกัน แต่พลังงานแตกต่างกัน
   ค. อาหารที่อยู่ในหมวดเดียวกัน มีปริมาณสารอาหาร และพลังงานใกล้เคียงกัน
   ง. อาหารที่อยู่ต่างหมวดกัน มีปริมาณสารอาหารแตกต่างกัน แต่พลังงานใกล้เคียงกัน

12. อาหารข้อใด จัดอยู่ในหมวดเดียวกัน สามารถแลกเปลี่ยนกันได้
   ก. บะหมี่ กับ กะหล่ำปลี
   ข. เต้าหู้ กับ มันต้ม
   ค. กะทิ กับ มายองเนส
   ง. วุ้นเส้น กับ หัวไชเท้า

13. อาหารในข้อใดต่อไปนี้ **<u>ไม่สามารถแลกเปลี่ยนกันหรือใช้แทนกันได้</u>**
   ก. ไข่ไก่ 1 ฟอง กับ เนื้อไก่ 2 ช้อนโต๊ะ
   ข. บะหมี่ 1 ก้อน กับ ข้าว 1 ทัพพีเล็ก
   ค. ดอกกุยช่าย 1 ถ้วยตวง กับ คะน้า 1 ถ้วยตวง
   ง. เงาะ 4 ผล กับ แตงโม 1 ผล

14. ผักสุก 1 ส่วน หมายถึงข้อใด
    ก. ผักสุก 1 ช้อนโต๊ะ
    ข. ผักสุก 2 ช้อนโต๊ะ
    ค. ผักสุก ½ ถ้วยตวง
    ง. ผักสุก 2 ถ้วยตวง

15. จากฉลากโภชนาการ "อาหารหนึ่งหน่วยบริโภค" หมายถึงข้อใด
    ก. ปริมาณอาหารที่คนไทยปกติทั่วไปรับประทานได้หมดภายใน 1 ครั้ง
    ข. ปริมาณอาหารที่ควรรับประทานให้หมดภายใน 1 ครั้ง
    ค. ปริมาณอาหารที่ควรรับประทานให้หมดภายใน 1 วัน
    ง. ปริมาณอาหารที่กำหนดให้บรรจุในผลิตภัณฑ์อาหารสำหรับบริโภค

ตอนที่ 2

คำชี้แจง เติมเครื่องหมายถูก (✓) หรือ เครื่องหมายผิด (X) ลงในช่องว่าง

16. _____ มะละกอสุก กล้วย ฟักทอง เป็นอาหารที่มีโพแทสเซียมต่ำ
17. _____ อาหารจำพวกขนมปัง ไม่มีโซเดียม สามารถทานได้ในปริมาณที่ต้องการ
18. _____ แดช ไดเอ็ท (DASH diet) เน้นการบริโภคผัก ผลไม้ นมไขมันต่ำ ถั่ว และลดอาหารมันจัดเค็มจัด
19. _____ จากเทคนิคการนับปริมาณโซเดียมในอาหาร ไม่ควรได้รับเกิน 10 ใบแดง ต่อวัน
20. _____ การควบคุมอาหารที่มีปริมาณโซเดียมสูง ควรลดอาหารจำพวกขนมปัง อาหารกระป๋อง ซีอิ๊วหรือซอสปรุงรส

APPENDIX D

<u>แบบประเมินความพึงพอใจในการเรียนรู้จากมัลติมีเดียเว็บไซต์</u>

<u>คำชี้แจง</u>: โปรดกรอกข้อความลงในช่องว่าง และทำเครื่องหมาย (X) ลงในช่องที่ตรงกับความคิดเห็นของท่านมากที่สุด

รายละเอียดในการประเมิน	**ดีมาก 4**	**ดี 3**	**พอใช้ 2**	**ควรปรับปรุง 1**
1. เนื้อหา				
1.1 เนื้อหาตรงตามจุดประสงค์				
• ทราบถึงเป้าหมายของการวางแผนการควบคุมการบริโภคอาหาร	.....	.....	.....	.....
• ทราบถึงแหล่งของสารอาหารที่มีผลต่อความดันโลหิต	.....	.....	.....	.....
• เข้าใจถึงบทบาทของโซเดียมในอาหารที่มีผลต่อสุขภาพ	.....	.....	.....	.....
• ทราบถึงหลักการในการควบคุมอาหารแบบแดชไดเอ็ท	.....	.....	.....	.....
• ทราบถึงปริมาณอาหารที่เหมาะสมเพื่อสุขภาพในแต่ละบุคคล	.....	.....	.....	.....
• ทราบถึงหลักการของเทคนิคการใช้จุดสีในการนับปริมาณโซเดียมในอาหาร	.....	.....	.....	.....

รายละเอียดในการประเมิน	ดีมาก 4	ดี 3	พอใช้ 2	ควรปรับปรุง 1
• สามารถคำนวนและนับจุดสีได้อย่างถูกต้อง	.....	.....	.....	.....
• เข้าใจถึงปริมาณอาหารหนึ่งส่วนแลกเปลี่ยน (exchange) หรือหนึ่งหน่วยบริโภค (serving) เพื่อสามารถใช้ในการกะประมาณอาหารที่รับประทานในชีวิตประจำวันได้	.....	.....	.....	.....
1.2 ปริมาณเนื้อหามีความเหมาะสม				
1.3 ความรู้ในเนื้อหาไม่ยากเกินไป อ่านแล้วเข้าใจได้				
1.4 การนำเสนอเนื้อหาไม่ซับซ้อน เข้าใจได้ง่าย ชวนติดตาม				
2. รูปแบบเว็บไซต์ 2.1 ภาพรวมของเว็บไซต์				
2.2 รูปแบบการจัดวาง ภาพ ตัวอักษร มีความเหมาะสม				
2.3 สี สวยงาม ดึงดูดความสนใจ				
2.4 ใช้งานได้สะดวก				
2.5 ความรวดเร็วของการเปิดหน้าเว็บเพจ				
3. ตัวอักษร 2.6 ลักษณะของตัวอักษรที่ใช้มีความเหมาะสม				
2.7 ขนาดของตัวอักษรมองเห็นชัดเจน				
2.6 ภาษาที่ใช้มีความชัดเจน อ่านแล้วเข้าใจง่าย				

รายละเอียดในการประเมิน	ดีมาก 4	ดี 3	พอใช้ 2	ควรปรับปรุง 1
4. ภาพประกอบ 2.7 ภาพมีความชัดเจน สวยงาม				
2.8 ขนาดของภาพ มีความเหมาะสม				
5. แอพพลิเคชั่นโปรแกรม* 2.9 ใช้งานง่าย ตรงกับเนื้อหา				
2.10 มีความสวยงาม การจัดวางเหมาะสม				
2.11 ความรวดเร็วในการใช้งาน				

* ***แอพพลิเคชั่นโปรแกรม*** เช่น โปรแกรมคำนวนดัชนีมวลกาย โปรแกรมคำนวนความต้องการพลังงาน โปรแกรมเกมส์ เป็นต้น

ข้อเสนอแนะอื่นๆ ในการปรับปรุงมัลติมีเดียเว็บไซต์การวางแผนการบริโภคอาหารในผู้ที่มีความดันโลหิตสูง

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ขอขอบพระคุณผู้เข้าร่วมโครงการทุกท่าน สำหรับความร่วมมือและคำแนะนำ-ติชมอันมีค่าเพื่อจะนำไปปรับปรุงเว็บไซต์กินดีใจดี (www.kindee-jaidee.com) ให้มีความสมบูรณ์พร้อม สำหรับเป็นสื่อให้ความรู้ด้านสุขภาพและโภชนาการต่อไปครับ

ไตรภพ มีชัย

นักศึกษาปริญญาโท สาขา โภชนาการป้องกันและบำบัด

สถาบันโภชนาการ มหาวิทยาลัยมหิดล

BIOGRAPHY

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