INDIVIDUALIZED EMPOWERMENT APPROACH IN DIETARY SELF-MANAGEMENT TO IMPROVE METABOLIC CONTROL IN PATIENTS WITH TYPE 2 DIABETES

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Thesis

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INDIVIDUALIZED EMPOWERMENT APPROACH TO DIETARY SELF-MANAGEMENT TO IMPROVE METABOLIC CONTROL IN PATIENTS WITH TYPE 2 DIABETES

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ABSTRACT

"Patient Empowerment" is an alternative approach to help patients making their own decisions in setting goals and making choices. This study aimed to measure the effectiveness of the empowerment approach in Thai type 2 diabetes patients on the dietary self-management and metabolic control.

Thirty patients were included in the study. An individualized empowerment program through 6 sessions in 16 weeks of dietary education and counseling was created. Personal goal cards and 3-day food records were used as main discussion tools during follow-up visits. Outcomes included changes of scores from problem-solving dietary scenarios, changes in dietary self-care behaviors, and levels of plasma glucose, HbA_{1c}, lipid profile, and body composition.

After 16 weeks individualized empowerment approach, results revealed that 16 out of 30 of the participants demonstrated higher problem-solving dietary scenario scores of all scenarios except for the "stress management scenario". 80% of the participants achieved their own goals at the end of the study and the mean percentage of goal achieved by participants was 87.2±10.0. There were significant reductions of carbohydrate, fat, alcohol, and salt consumption by participants after the study. There was also a significant reduction in the total calorie intake. Additionally, there was a significant decline in high fat meat and an increase in both very lean and lean meat consumption. Furthermore, there were reductions in total fat intake, both animal fat and cooking oils. Healthier cooking methods were also adopted (P<.001). Moreover, there was a significant increase in vegetable consumption. In conclusion, these changes led to a significant reduction in overall body composition, especially body weight (1.8 kg in 16-week) (P<.001), percentage of body fat (P<001), and blood pressure (P<0.04). Consequently, biochemical tests revealed significant reductions in blood cholesterol level and in glycemic control. After 16 weeks intervention, HbA_{1c} levels demonstrated significant decline by 1.7 % points (P<.001). Furthermore, there was no a significant decline in HbA_{1c} levels 3 months after completion of the program (P =0.146). These findings suggest that a step-by-step approach in empowerment process tends to facilitate better problem solving ability changes in dietary self-care behaviors which result in good glycemic and lipid control.

KEY WORDS: EMPOWERMENT/PROBLEM SOLVING/DIABETES/BEHAVIOR/ DIET COUNSELLING

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ผลของการเอื้ออำนาจในการตัดสินใจเกี่ยวกับการดูแลตนเองทางด้านอาหารแก่ผู้เป็นเบาหวานชนิดที่ 2 (INDIVIDUALIZED EMPOWERMENT APPROACH TO DIETARY SELF-MANAGEMENT TO IMPROVE METABOLIC CONTROL IN PATIENTS WITH TYPE 2 DIABETES)

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บทคัดย่อ

การเอื้ออำนาจ เป็นการช่วยให้ผู้เป็นเบาหวานตัดสินใจในการจัดการดูแลตนเองด้านอาหาร โดยการตั้งเป้าหมายและเลือกทางเลือกที่เหมาะสมให้กับตนเองได้ งานวิจัยนี้มีวัตถุประสงค์เพื่อต้องการวัดผลของการเสริมสร้างพลังความรับผิดชอบในการจัดการดูแลตนเองด้านอาหารต่อการควบคุมอาหาร ระดับน้ำตาลและไขมันในเลือดและต่อส่วนประกอบของร่างกายในผู้เป็นเบาหวานชนิดที่ 2

ผู้เป็นเบาหวานชนิดที่ 2 จำนวน 30 คน ได้รับการเสริมสร้างพลังความรับผิดชอบโดยการให้ข้อมูลและคำปรึกษาด้านอาหารเป็นรายบุคคล จำนวน 6 ครั้ง ในระยะเวลาของการศึกษา 16 สัปดาห์ ร่วมกับติดตามผลโดยใช้แบบบันทึกรายการอาหารที่บริโภค 3 วันและการ์ดเป้าหมายส่วนตัว ตัวชี้วัดความสำเร็จคือ การเปลี่ยนแปลงของระดับคะแนนความสามารถในการแก้ไขปัญหาในสถานการณ์จำลองด้านอาหาร การปรับเปลี่ยนพฤติกรรมการบริโภค และการเปลี่ยนของระดับน้ำตาลเฉลี่ย (HBA_{1C}) ไขมันในเลือดและส่วนประกอบของร่างกาย

เมื่อจบการศึกษาพบว่าผลการเอื้ออำนาจโดยการให้ข้อมูลและคำปรึกษาด้านอาหารเป็นรายบุคคล ทำให้ผู้เป็นเบาหวาน 16 คน ในจำนวน 30 คน สามารถจัดการแก้ไขปัญหาในสถานการณ์จำลองด้านอาหารดีขึ้นกว่าก่อนการศึกษา ยกเว้นในสถานการณ์จำลองด้านการจัดการความเครียด ร้อยละ 80 ของจำนวนผู้เป็นเบาหวานทั้งหมดประสบความสำเร็จตามเป้าหมายการจัดการด้านอาหารของตน และพบว่าผู้ป่วยสามารถทำได้ร้อยละ 87.2±10ของเป้าที่ตั้งไว้ หลังจากการเอื้ออำนาจในการตัดสินใจแก่ผู้เป็นเบาหวานแล้วพบว่าผู้ป่วยมีการบริโภคอาหารประเภทคาร์โบไฮเดรต ไขมัน แอลกอฮอล์ และเกลือในปริมาณลดลงอย่างมีนัยสำคัญทางสถิติ มีการบริโภคผักมากขึ้น และยังพบว่าผู้เป็นเบาหวานบริโภคอาหารโปรตีนจากเนื้อสัตว์ไขมันสูงในปริมาณลดลง นอกจากนั้นการบริโภคอาหารไขมันและการเลือกบริโภคอาหารที่ปรุงด้วยน้ำมันลดลง (P<.001) พบการลดลงอย่างมีนัยสำคัญทางสถิติของส่วนประกอบของร่างกายโดยรวมและพบน้ำหนักตัวลดลง 1.8 กิโลกรัมในช่วง 4 เดือนของการศึกษา (P<.001) และมีการลดลงของเปอร์เซ็นต์ไขมันในร่างกาย (P<.001) และความดันโลหิต (*P*<0.04) ผลการตรวจทางห้องปฏิบัติการพบว่าระดับคอเลสเตอรอลหลังการศึกษามีการลดลงอย่างมีนัยสำคัญทางสถิติ นอกจากนั้นระดับHbA_{1c} มีการลดลงเฉลี่ย 1.7 แต้ม (%) ในช่วง 16 สัปดาห์ของการศึกษาอย่างมีนัยสำคัญทางสถิติ (P<.001) อีกทั้งไม่พบความแตกต่างของระดับ HbA_{1c} จากการติดตามผลหลังจบการศึกษาไปแล้ว 3 เดือน (P=0.146) จากผลการศึกษานี้แสดงให้เห็นว่า การใช้กระบวนการเอื้ออำนาจอย่างเป็นขั้นตอน ช่วยให้ผู้เป็นเบาหวานสามารถตัดสินใจในการแก้ไขปัญหาด้านอาหารได้ดีขึ้น การตั้งเป้าหมายที่ละน้อยของผู้เป็นเบาหวานจะนำมาสู่ความสำเร็จในเป้าหมายของตนเอง ปรับเปลี่ยนวิถีการบริโภคที่เหมาะสมสามารถช่วยให้คุมเบาหวานและไขมันในเลือดได้ดีขึ้น

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LIST OF ABBREVIATIONS

g	gram
CAD	Coronary artery disease
HDL-C	High density lipoprotein cholesterol
LDL-C	Low density lipoprotein cholesterol
MS	Metabolic Syndrome
NCEP ATP III	The Third Adult Treatment Panel (III) of the National Cholesterol Education Program.
BMI	Body mass index
DCCT	The Diabetes Control and Complications Trial
UKPDS	The United Kingdom Prospective Diabetes Study
ADA	American Diabetes Association
SMBG	Self monitoring blood glucose
CVD	Cardiovascular disease
MNT	Medial Nutrition Therapy
HbA_{1c}	Hemoglobin A_{1c}
RDA	Recommended dietary allowance
DRI	Dietary reference intake
OHA	Oral hypoglycemic agent
Tb	Tuberculosis
DEXA	Dual energy x-ray absorptionmetry
PSDS	Problem solving dietary scenario
Semi-QFFQ	Semi-quantitative food frequency questionnaire

LIST OF ABBREVIATIONS (Cont.)

FPG	Fasting plasma glucose
WC	Waist circumference
MAC	Mid upper-arm circumference
TSF	Tricep skinfold thickness
SPSS/PC	The Statistical Package for the Social Sciences/personal computer
SD	Standard deviation
LOCF	Last observation carry forward
IQR	Interquartile range
BW	Body weight
SBP	Systolic blood pressure
DBP	Diastolic blood pressure
FBG	Fasting blood glucose
TG	Triglyceride
95% CI	95% confident interval
SFA	Saturated fatty acids
MUFA	Monounsaturated fatty acids
PUFA	Polyunsaturated fatty acids
% CHO	Percentage of carbohydrate distribution
% PROT	Percentage of protein distribution
%FAT	Percentage of fat distribution
GI food	Glycemic index food
Cr	Creatinine
CHD	Coronary heart disease
WHO	World Health Organization

CHAPTER I
INTRODUCTION

1.1 Background and Rationale

Type 2 diabetes is the most common metabolic disease that is serious, progressive, and costly. The epidemiologic studies have clearly shown that type 2 diabetes results from an interaction between the genetic predisposition and lifestyle factors including obesity, physical inactivity and inappropriate eating habit. Diabetes is likely to be an important determinant of the vascular burden, as a major risk factor for the development of coronary artery disease (CAD). CAD and diabetes mellitus are the most common causes of morbidity and mortality in most countries for over the decade (1). They share a number of common risk factors that tend to cluster together in the same individual: central obesity, elevated triglycerides, depressed HDL cholesterol, elevated blood pressure, insulin resistance, glucose intolerance, and an inflammatory/prothrombotic state. This constellation of risk factors has been termed the *metabolic syndrome* (MS) by the Third Adult Treatment Panel (ATP III) of the National Cholesterol Education Program (NCEP) (2).

The aim of clinical management of the MS is to prevent morbidity and mortality from its consequences—diabetes and CAD. First-line therapy involves lifestyle modification intended to improve insulin resistance, hyperinsulinemia, and excessive circulating levels of free fatty acids. If these efforts are not sufficient to adequately improve the metabolic profile, drug therapy may need to be used to address specific risk factors, such as agents to treat dyslipidemia, hypertension, obesity, glucose intolerance, and inflammatory and prothrombotic states. Lifestyle modifications for the MS include (1) loss of excess body fat, (2) increased physical activity, (3) smoking cessation, and (4) dietary modification. Apart from its role in the development of obesity, the impact of dietary intake on the development of the MS and reacted diabetes and CAD risk has received much less attention in treatment guidelines.

The International Collaborative study of Cardiovascular Disease in Asia (InterAsia) (3), a population–based survey of cardiovascular risk factors, was conducted in Thailand and China during the year 2000. This study has clearly demonstrated that diabetes and impaired fasting glucose are common in Thai adults, but one-half of the cases are undiagnosed indicated that the prevalence of diabetes among Thai population is underreported (4). The estimated national prevalence of diabetes in Thai adults over 35 years of age during 2000 was 9.6% (2.4 million people) and impaired fasting glucose was 5.4% (1.4 million people). Diagnosed diabetes, undiagnosed diabetes, and impaired fasting glucose were associated with greater age, BMI, waist-to-hip ratio, systolic blood pressure, total cholesterol, and serum creatinine levels (4).Therefore, the enormous economic and social cost of this disease makes a compelling case for prevention. Current evidences of the effectiveness of the exercise and dietary control program in the delay or prevention of the onset of macrovascular diseases such as cerebrovascular diseases, cardiovascular diseases and ischemic diseases of the extremities is the most cost saving strategy of treatment.

Since 1991, the results of the Diabetes Control and Complications Trial (DCCT), and the United Kingdom Prospective Diabetes Study (UKPDS) were announced, and many new medications and devices have become available. The number of new therapies has provided more options for people with diabetes and health professionals. The Internet and other technologies have allowed people with diabetes to become better informed consumers, which have reinforced the power of information. While there have been many advances, diabetes is increasing worldwide and still remains a self-managed chronic disease. The fundamental requirement for diabetes self-management is patient education. Diabetes education has been used as a tool to help develop self-management education because people with diabetes make multiple choices every day that affect their condition. People with diabetes are not a homogenous group, they vary by type, treatment of diabetes, severity of the disease, the experiences of acute or chronic complication, culture, psychosocial, demographic, intellectual, and other domains across the lifespan, consequently, self-management education needs to be tailored to the individual.

For many years traditional diabetes education has been viewed as a process designed to provide patients with the information and skills to adhere to the treatment recommendations of health care professionals. This approach assumes that the primary focus of patient education should be glucose management. One consequence of conceptualizing diabetes patient education in this manner is a strong emphasis on metabolic control and patient adherence as the primary measures of the effectiveness of diabetes patient education programs. In addition, many people with diabetes do not achieve optimal outcomes and still experience devastating complications that result in decreased quality of life. In spite of our attempts to encourage and persuade them to change their behaviors, many educators are often frustrated and discouraged when they are unwilling to follow our advice and achieve the desired outcomes that created tension between people with diabetes and dietitians.

Because of this frustration, many diabetes healthcare professionals attempted to resolve dissatisfaction by seeking information about behavioral and psychosocial techniques, trying new methods of education, attempting to define the one best education program, however, they were ineffective models (5) and some studies found that the traditional compliance-based approach was an inappropriate conceptual structure for the practice and evaluation of the diabetes patient education (6). Accordingly, a different vision of diabetes education was found and referred to as “patient empowerment” (6).

Patient empowerment reflects on the belief in patient autonomy and the right and responsibility of patients to make their own decisions. Empowerment is different from the traditional vision that the empowerment-based approach requires a paradigm shift from provider-centered care to client-centered collaborative care. The goal of diabetes education within this approach is to enable people with diabetes to make their own choices, not to get them to comply with or adhere to provider-selected goals. Within this model, our role is not to change our patients’ behaviors, but to inspire, inform, support, and facilitate their efforts to recognize and achieve their own goals. Studies indicated that patient empowerment is an effective approach to developing educational interventions for addressing the psychosocial aspects of living with diabetes.

Furthermore, patient empowerment is conductive to improving blood glucose control. In an ideal setting, patient education would address equally blood glucose management and the psychosocial challenges of living with diabetes.

In Thailand, diabetes experts have focused on utilizing behavioral modification program in the treatment plan of diabetes only a few years ago. Behavior change is the unique outcome measurement for diabetes self-management education and diabetes self-care behavior measures determine the effectiveness of diabetes self-management education at individual, participants, and population levels. Therefore, it is the cornerstone of care for individuals diagnosed with diabetes who want to achieve successful health-related outcome but it has not yet been concerned in the real client-centered approach to support behavior change in type 2 diabetes. The goal of diabetes control is to adhere to provider-selected goals, not to adhere to patient's self-selected goals. There are only few researches that related to empowerment approach in overall specific diabetes self-care behavior, but most of them had been used in other educational contexts for many years such as smoking and alcohol cessation, and for person with disabilities. There is no research that related to empowerment approach to focus on only dietary self-management in type 2 diabetes. In general, healthcare professional thought that empowerment approach is a complex process and hard to provide in the real clinical practice setting in a variety of reasons i.e. familiarity with the traditional approach, time consuming, lack of resources, and educational tools. Accordingly, using the individualized empowerment approach to support behavior change in diabetes self-management education is interesting and challenging.

This study was aimed to create a concept and process to provide the individualized empowerment approach program for patients with type 2 diabetes, and to help participants identify diabetes–related problems and issues on which they wanted to work on; identify thoughts and feelings associated with the issue; identify health-related attitudes and beliefs underlying the problem and establish diabetes self-care goals; and finally develop as well as commit to a plan for achieving the goal. Participants received the dietary knowledge which they were concerned about. The dietary recommendations were based on ADA guideline and Thai Association of Diabetes Educator. Some information were modified from participant notebook of

"Lifestyle Balance: The Diabetes Prevention Program's *Lifestyle Change Program*" that was developed by the Diabetes Prevention Program Lifestyle Resource Core (7). A set of education materials was provided to the participant. A 3-day food record and personal goal card were provided after each visit. Self monitoring blood glucose (SMBG) meter printouts were prepared before each follow-up visit in case of participants who owned one. The objective of this study was to test the effectiveness of individualized empowerment approach in dietary self-management education in patients with type 2 diabetes.

1.2 Objective of study

1.2.1 General objective

To test the effectiveness of the individualized empowerment approach in dietary self-management education to improve metabolic control in patients with type 2 diabetes.

1.2.2 Specific objectives

1. To test problem solving ability in dietary specific situations after applying this approach.
2. To assess the changes in dietary self-care behavior with this approach.
3. To test the changes in metabolic control resulted from this approach.

1.3 Hypotheses

The dietary self-management education through individualized empowerment-based approach was more effective in dietary problem solving ability and changing the behavior of patients with type 2 diabetes than the conventional approach and led to the improvement of metabolic control with the satisfaction in attendance at this program.

1.4 Expected benefits & Application

- People with diabetes could receive dietary knowledge related to self-management which they concern to their own specific situations and problem-based solving.
- People with diabetes could be facilitated in their own decision making for taking care of diabetes focusing on dietary modification leading to dietary self-care behavior change.
- People with diabetes could have more potential in dietary self-dependence and decrease the time spent for depending on health care professional.
- People with diabetes would improve their metabolic control with satisfaction.
- Dietitians and health care teams could apply this concept and process of individualized empowerment approach to implement in the clinical practice setting with type 2 diabetes patients either group or individual.

1.5 Definition of terms

1. **Empowerment approach:** the application of pre-experimental design research in the process of individualized-dietary education and counseling in persons with type 2 diabetes to facilitate their own decisions in dietary self-care**.** The 5 steps of empowerment approach applied by Anderson and Funnnell (85) are
    - Problem identification
    - Feeling exploration
    - Making a plan
    - Goal setting
    - Result evaluation
2. **Dietary self-management education:** the application of individualized empowerment approach to provide specific dietary knowledge and skill training, help participants identify barriers, and facilitate dietary problem solving and coping skills to achieve effective dietary self-care behavior and behavior change. It is the position of the American Associations of Diabetes Educators (AADE) (92).

3. **Behavior change:** It refers to the unique outcome measurement for dietary self-management education**.** Behavior change for dietary self-management activities is directly affected by the dietary education and counseling, and is an indicator of overall program achievement. In this study, it was measured by the changes in macronutrients intake, different food group consumed, and method of cooking.

4. **Dietary self-care behavior:** It was identified as key behavior (eating) to diabetes self-management**.** These self-care behaviors and their measurements have been defined as one of the AADE 7 (7-diabetes self-care behaviors) (122) core measures of outcomes performance.

   4.1 Immediate outcome measurement (learning and barrier resolution):

   - Knowledge: this study focused on effect of food on blood glucose, source of CHO, meal plan (what to eat, when to eat, how much to eat), resources to assist in food choices
   - Skill: meal planning, carbohydrate counting, and label reading
   - Barrier resolution: environmental triggers, and emotional

   4.2 Intermediate outcome measurement (behavior):

   - Measures: this study measured type of food choices, amount of food consumed, alcohol intake, effect of foods on metabolic outcome (FPG, HbA1c, Lipid profile values), and specific dietary situations and problem solving by the Problem Solving Dietary Scenarios (PSDS test).

   - Methods of measurement: this study used 3-day food record, quantitative food frequency questionnaire (QFFQ), and information from SOAP's notes.

5. **Problem solving ability:** the process of solving problem in which general orientation as based on three attitudes: (a) an awareness of and an ability to accept that problems occur as a natural part of life and that is possible to solve most problems effectively, (b) an ability to recognize a problem when it occurs, and (c) an ability to inhibit tendencies either to respond impulsively or not to act. However**,** four key components of problem solving can be derived

from understanding of problem solving in dietary self-management. The first component is *problem-solving skill, or process* that effective problem solving follows a rational progression of steps, including problem definition, generation of alternatives, selection of alternatives, implementation of alternatives, and evaluation. The second component is *problem solving orientation*. Because disease self-management occurs within the context of human behavior, interpersonal motivational factors, as well as one's attitudes and belief systems about the disease and problem encountered, becomes influential factors in problem solving. The third key component is *domain-specific knowledge* and the fourth component is *transfer of past experience*. Learning from past problem situations allow for the building of a repertoire of successful problem solving strategies for different types of problem situations.

In this study, we measured problem solving ability by the problem solving dietary scenarios (PSDS) test. It was a set of 5-open-ended questionnaires. Participants were asked to describe how they would react to each scenario and prompted for a coping strategy for each situation. We provided an overall problem- solving rating for each situation on a 4-point scale (from 0 = poor strategy to 3 = excellent strategy).

6. **Goal setting:** the application of step-by-step empowerment approach in dietary counseling to encourage participants make a specific action plan. With asking the participants to generate a list of behaviors that could help them reach their long-term goal. Next, the participants chose one behavior from the list to try. The action should contain a behavior change that is easily measured and should define the following: (1) what to do, (2) how to do it, and (3) when to start. Participants should be able to describe their action plans with no guidance by the researcher. In this study, we measured goal achievement of the participant by using portable personal goal card. We provided it after each visit; followed the number of days achieved, and participants were invited to identify a goal and a behavioral step as a dietary self-management experiment rather than succeeding or failing.

7. **Anthropometric assessment of body composition:** based on a model in which the body consists of two compartments: fat and fat-free mass. Assessment of body fat can use skinfold thickness measurement and assessed using mid-upper arm circumference measurement for assessment of fat-free mass. We assessed tricep skinfold thickness, % of tissue body fat (by DEXA), and mid-upper arm circumference measurements in every visit. In this study, indices of body composition were used in clinical setting to evaluate the effectiveness of nutrition intervention program.

8. **Metabolic control:** in this study refers to keep blood glucose, $HbA_{1c,}$ and lipid profile [total cholesterol (TC), triglyceride (TG), high density lipoprotein cholesterol (HDL-C), and low density lipoprotein cholesterol (LDL-C)] under control or better than the beginning of the empowerment process.

CHAPTER II
LITERATURE REVIEW

In the writing of this thesis "Effectiveness of individualized empowerment approach in dietary self-management education to improve metabolic control in type 2 diabetes" there has been a study and revision of the related literature and research by dividing the study into two parts:

PART 1: Knowledge about Type 2 Diabetes

2.1 Epidemiology of Type 2 Diabetes

2.2 Medical Nutrition Therapy in the Management of Type 2 Diabetes

2.3 Goals of medical nutrition therapy for persons with diabetes

2.4 Nutrition-related strategies for achieving metabolic goals for type 2 diabetes

PART 2: Theories and concepts

2.5 Lifestyle Counseling Strategies for Behavior Change

2.6 Diabetes self-management education (DSME)

2.7 Empowerment Approach

PART 1: Knowledge about Type 2 Diabetes

2.1 Epidemiology of type 2 diabetes

Diabetes is a chronic, noncommunicable, and cardiovascular disease. About 58 million people die every year from cardiovascular disease, for which diabetes and hypertension are major predisposing factors (10). Diabetes is rapidly emerging as a global health care problem that threatens to reach pandemic levels by 2030; the total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030.

The prevalence of diabetes is higher in men than women, but there are more women with diabetes than men. The urban population in developing countries is projected to double between 2000 and 2030. The most important demographic change to diabetes prevalence across the world appears to be the increase in the proportion of people >65 years of age. These findings indicate that the "diabetes epidemic" will continue even if levels of obesity remain constant (9). Prevalence rates in the developing world, particularly in the Asia-Pacific region, are already high and expected to rise more quickly than elsewhere where the number of people with diabetes is expected to increase from 84 million to 228 million (10).

The increase in the prevalence of type 2 diabetes is closely linked to the upsurge in obesity. The high risk of both diabetes and cardiovascular disease associated with obesity in Asians may be due to a predisposition to abdominal obesity, which can lead to the metabolic syndrome (11).

In Thailand, the prevalence of type 2 diabetes among the population aged ≤35 years was 9.6% in 2001, an increase of 20% over a period of 5 years (12). Cardiovascular disease (CVD) is one of the leading causes of death in Thailand (13), and individuals with diabetes have a two to fourfold greater risk of developing CVD than those without (14). The burden of diabetes and its complications, which include other diseases besides CVD (15), imposes a massive load on the Thai health care system. Lifestyle modification has been proven to effectively prevent and delay the development of diabetes (16-18).

2.2 Medical nutrition therapy (MNT) for diabetes

Diabetes is a chronic progressive disease that usually requires lifestyle changes, especially in the areas of nutrition and physical activity. The goal of MNT is to assist persons with diabetes in making self-directed behaviors changes that will improve their overall health and the management of diabetes (19). Achieving optimal nutrition through healthy food choices is the underlying principle of the American Diabetes Association (ADA) nutrition recommendations for people with diabetes (20). However, in addition to concerns related to improve health through healthy food choices, MNT for diabetes focuses on goals and strategies for the treatment and prevention of diabetes and on achieving optimal metabolic outcomes related to glycemia, lipid profiles, and blood pressure level (20, 21). The ADA nutrition recommendations for health are similar to the nutrition recommendations for the prevention of chronic diseases from other major health organizations. With these recommendations, a healthy diet consists of multiple servings of fruits and vegetables, whole grains, low-fat dairy products, fish, lean meats, and poultry (19).

MNT is an essential component of effective in improving metabolic control in diabetes management (22-29). Randomized controlled trials and outcome studies of medical nutrition therapy (MNT) in the management of type 2 diabetes have reported improved glycemic outcomes (HbA1c decreases of 1.0-2.0% point, depending on the duration of diabetes) (22,23). MNT in these studies was provided by dietitians (nutritionists) as MNT only or as MNT in combination with diabetes self-management training. Intervention included reduced energy intake and/or reduced carbohydrate/fat intake, and basic nutrition and healthy food choices for improved glycemic control. Outcomes of the interventions were measured by 3 months (21, 30-34). MNT involves the use of specific nutrition services to treat an illness or condition and incorporates the process or system for providing individualized nutrition care and specific lifestyle recommendations for that cares. The process of providing care includes assessment, intervention/education, goal setting, and evaluation of outcomes. Lifestyle recommendations include food/nutrition and physical activity strategies.

2.3 Goals of medical nutrition therapy for persons with diabetes (35)

The primary goal of MNT is to assist in achieving and maintaining optimal metabolic outcomes, including blood glucose levels in the normal range or as close to normal as is safely possible. This is achieved by balancing food intake, physical activity, and diabetes medications and is necessary to prevent the complications of diabetes (35, 36). In addition, a lipid and lipoprotein profile that reduces the risk for vascular disease, and blood pressure levels in the normal range or, if safely, as close to normal as possible. Summary of recommendations for adults with diabetes is showed in Table 2.1.

Table 2.1 Summary of recommendations for adults with diabetes[1]

Glycemic control	
HbA_{1c}	< 7.0%*
Preprandial capillary plasma glucose	90-130 mg/dl
Peak postprandial capillary plasma glucose†	< 180 mg/dl
Blood pressure	< 130/80 mmHg
Lipid‡	
LDL	< 100 mg/dl
Triglyceride	< 150 mg/dl
HDL	> 40 mg/dl§

* Referenced to a nondiabetic range of 4.0-6.0% using a DCCT-based assay. † Postprandial glucose measurements should be made 1-2 h after the beginning of the meal, generally peak levels in patients with diabetes. ‡ Current NCEP/ATP III guideline suggest that in patients with triglycerides ≥ 200 mg/dl, the "non-HDL cholesterol" (total cholesterol minus by HDL) be utilized. The goal is ≤ 130 mg/dl (37). § For women, it has been suggested that the HDL goal be increased by 10 mg/dl. [1] Source: American Diabetes Association: Standard of medical care in diabetes 2007 (38).

Prevent or at least slow the rate of development of the chronic complications of diabetes by modifying nutrient intake and lifestyle (38). Individualize nutrition care to achieve health-related goals with attention to personal preferences, cultural appropriateness, and the need/willingness to change lifestyle habits (35).

2.4 Nutrition-related strategies for achieving metabolic goals for type 2 diabetes

MNT for persons with type 2 diabetes focuses on lifestyle strategies that can assist in improving and maintaining normal/optimal metabolic parameters: optimal glucose control, improved lipid profile, and control of blood pressure (21). In overweight and obese insulin resistant individuals, modest weight loss has been shown to improve insulin resistance. Thus, weight loss is recommended for all such individuals who have diabetes.

Structured programs that emphasize lifestyle changes, including education, reduced energy and fat (~30% of total energy) intake, regular physical activity, and regular participant contact, can produce long-term weight loss on the order of 5–7% of starting weight. Thus, lifestyle change should be the primary approach to weight loss.

Standard weight loss diets provide 500–1,000 fewer calories than estimated to be necessary for weight maintenance and initially result in a loss of ~1–2 lb/week. Although many people can lose some weight (as much as 10% of initial weight in ~6 months) with such diets, without continued support and follow-up, people usually regain the weight they have lost (35).

The optimal macronutrient distribution of weight loss diets has not been established. Although low-fat diets have traditionally been promoted for weight loss, two randomized controlled trials found that subjects on low-carbohydrate diets (<130 g/day of carbohydrate) lost more weight at 6 months than subjects on low-fat diets (50, 51). However, at 1 year, the difference in weight loss between the low-carbohydrate and low-fat diets was not significant and weight loss was modest with both diets. Changes in serum triglyceride and HDL cholesterol were more favorable with the low-carbohydrate diets. In one study, those subjects with type 2 diabetes demonstrated a greater decrease in hemoglobin A_{1C} with a low-carbohydrate diet than with a low-fat diet (51). A recent meta-analysis showed that at 6 months, low-carbohydrate diets were associated with greater improvements in triglyceride and HDL cholesterol concentrations than low-fat diets; however, LDL cholesterol was significantly higher on the low-carbohydrate diets (52). Further research is needed to determine the long-term efficacy and safety of low-carbohydrate diets (43). The recommended dietary

allowance (RDA) for carbohydrate (130 g/day) is an average minimum requirement and is lower than most individually consumed (35). Therefore, low-carbohydrate diets (restricting total carbohydrate to <130 g/day) are not recommended. An important reason for not recommending low-carbohydrate diets is that they eliminate many foods that are important sources of fiber, vitamins, and minerals and are important in dietary palatability.

Low-carbohydrate diets (restricting total carbohydrate to <130 g/day) are not recommended in the treatment of overweight/obesity. The long-term effects of these diets are unknown and although such diets produce short-term weight loss, maintenance of weight loss is similar to that from low-fat diets (50,51) and impact on CVD risk profile is uncertain. Physical activity and behavior modification are important components of weight loss programs and are most helpful in maintenance of weight loss (35).

The importance of controlling body weight in reducing risks related to diabetes is of great importance. Therefore, these nutrition recommendations start by considering energy balance and weight loss strategies. In Asian populations, the proportion of people at high risk of type 2 diabetes and CVD is significant at BMIs of >23 kg/m^2 (39). Visceral body fat, as measured by waist circumference ≥80 cms in women and ≥90 cms in men, is used in conjunction with BMI to assess risk of type 2 diabetes and CVD (40). Lower waist circumference cut points (≥31 inches in women, ≥ 35 inches in men) may be appropriate for Asian populations (41). With the measurement of central obesity, waist circumference; waist to hip ratio; and waist to height ratio, could predict cardiovascular risk better than BMI in Thai adults (42).

Because of the effects of obesity on insulin resistance, weight loss is an important therapeutic objective for individuals with pre-diabetes or diabetes. However, long-term weight loss is difficult for most people to accomplish. This is probably because the central nervous system plays an important role in regulating energy intake and expenditure. Short-term studies have demonstrated that moderate weight loss (5% of body weight) in subjects with type 2 diabetes is associated with decreased insulin resistance, improved measures of glycemia and lipemia, and reduced blood pressure (35,43). Longer-term studies (≥52 weeks) using pharmacotherapy for weight loss in

adults with type 2 diabetes produced modest reductions in weight and HbA_{1C} (44), although improvement in HbA_{1C} was not seen in all studies (45,46). Look AHEAD (Action for Health in Diabetes) is a large National Institutes of Health–sponsored clinical trial designed to determine if long-term weight loss will improve glycemia and prevent cardiovascular events (47). When completed, this study should provide insight into the effects of long-term weight loss on important clinical outcomes.

Evidence demonstrates that structured, intensive lifestyle programs involving participant education, individualized counseling, reduced dietary energy and fat (~ 30% of total energy) intake, regular physical activity, and frequent participant contact are necessary to produce long-term weight loss of 5–7% of starting weight (21). The role of lifestyle modification in the management of weight and type 2 diabetes was recently reviewed (43). Although structured lifestyle programs have been effective when delivered in well-funded clinical trials, it is not clear how the results should be translated into clinical practice. Organization, delivery, and funding of lifestyle interventions are all issues that must be addressed. Third-party payers may not provide adequate benefits for sufficient MNT frequency and time to achieve weight loss goals (48).

Carbohydrate in diabetes management

Control of blood glucose in an effort to achieve normal or near-normal levels is a primary goal of diabetes management. Food and nutrition interventions that reduce postprandial blood glucose excursions are important in this regard, since dietary carbohydrate is the major determinant of postprandial glucose levels. A dietary pattern that includes carbohydrate from fruits, vegetables, whole grains, legumes, and low-fat milk is encouraged for good health (35). Low-carbohydrate diets might seem to be a logical approach to lowering postprandial glucose. However, foods that contain carbohydrate are important sources of energy, fiber, vitamins, and minerals and are important in dietary palatability. Therefore, these foods are important components of the diet for individuals with diabetes. Issues related to carbohydrate and glycemia have previously been extensively reviewed in American Diabetes Association reports and nutrition recommendations for the general public (21, 49).

A 2004 ADA statement addressed the effects of the amount and type of carbohydrate in diabetes management (49). As noted previously, low-carbohydrate diets, restricting total carbohydrate to < 130 g/day, are not recommended in the management of diabetes. Monitoring carbohydrate, whether by carbohydrate counting, exchanges, or experienced-based estimation remains a key strategy in achieving glycemic control (35).

The use of glycemic index and glycemic load may provide a modest additional benefit over that observed when total carbohydrate is considered alone (35). The amount of carbohydrate ingested is usually the primary determinant of postprandial response, but the type of carbohydrate also affects this response. Intrinsic variables that influence the effect of carbohydrate-containing foods on blood glucose response include the specific type of food ingested, type of starch (amylose versus amylopectin), and style of preparation (cooking method and time, amount of heat or moisture used), ripeness, and degree of processing (35). Extrinsic variables that may influence glucose response include fasting or preprandial blood glucose level, macronutrient distribution of the meal in which the food is consumed, available insulin, and degree of insulin resistance (35).

The glycemic index of foods was developed to compare the postprandial responses to constant amounts of different carbohydrate-containing foods (53). The glycemic index of a food is the increase above fasting in the blood glucose area over 2 h after ingestion of a constant amount of that food (usually a 50-g carbohydrate portion) divided by the response to a reference food (usually glucose or white bread) (35). The glycemic loads of foods, meals, and diets are calculated by multiplying the glycemic index of the constituent foods by the amounts of carbohydrate in each food and then totaling the values for all foods. Foods with low glycemic indexes include oats, barley, bulgur, beans, lentils, legumes, pasta, pumpernickel (coarse rye) bread, apples, oranges, milk, yogurt, and ice cream. Fiber, fructose, lactose, and fat are dietary constituents that tend to lower glycemic response. Potential methodological problems with the glycemic index have been noted (54).

Several randomized clinical trials have reported that low–glycemic index diets reduce glycemia in diabetic subjects, but other clinical trials have not confirmed this effect (49). Nevertheless, a recent meta-analysis of low–glycemic index diet trials in diabetic subjects showed that such diets produced a 0.4% decrement in HbA_{1C} when compared with high–glycemic index diets (55). However, it appears that most individuals already consume a moderate–glycemic index diet (56, 57). Thus, it appears that in individuals consuming a high–glycemic index diet, low–glycemic index diets can produce a modest benefit in controlling postprandial hyperglycemia.

As for the general population, people with diabetes are encouraged to choose a variety of fiber-containing foods such as legumes, fiber-rich cereals ($\geq$ 5 g fiber/serving), fruits, vegetables, and whole grain products because they provide vitamins, minerals, and other substances important for good health. Moreover, there are data suggesting that consuming a high-fiber diet ($\sim$50 g fiber/day) reduces glycemia, hyperinsulinemia, and lipemia in subjects with type 2 diabetes (21). Palatability, limited food choices, and gastrointestinal side effects are potential barriers to achieving such high-fiber intakes. However, increased fiber intake appears to be desirable for people with diabetes, and a first priority might be to encourage them to achieve the fiber intake goals set for the general population of 14 g/1,000 kcal (35).

Sucrose-containing foods can be substituted for other carbohydrates in the meal plan or, if added to the meal plan but should be taken to avoid excess energy intake. Alternatively, sugar alcohols and nonnutritive sweeteners are safe when consumed within the daily intake levels established by the Food and Drug Administration (FDA) (35).

Dietary fat and cholesterol in diabetes management

The primary goal with respect to dietary fat in individuals with diabetes is to limit saturated fatty acids, *trans* fatty acids, and cholesterol intakes so as to reduce risk for CVD. Saturated and *trans* fatty acids are the principal dietary determinants of

plasma LDL cholesterol. In nondiabetic individuals, reducing saturated and *trans* fatty acids and cholesterol intakes decreases plasma total and LDL cholesterol. Reducing saturated fatty acids may also reduce HDL cholesterol. Importantly, the ratio of LDL cholesterol to HDL cholesterol is not adversely affected. Studies in individuals with diabetes demonstrating the effects of specific percentages of dietary saturated and *trans* fatty acids and specific amounts of dietary cholesterol on plasma lipids are not available. Therefore, because of a lack of specific information, it is recommended that the dietary goals for individuals with diabetes be the same as for individuals with preexisting CVD, since the two groups appear to have equivalent cardiovascular risk. Thus, saturated fatty acids <7% of total energy, minimal intake of *trans* fatty acids, and cholesterol intake <200 mg daily are recommended (35).

In metabolic studies in which energy intake and weight are held constant, diets low in saturated fatty acids and high in either carbohydrate or *cis*-monounsaturated fatty acids lowered plasma LDL cholesterol equivalently (21,58). The high-carbohydrate diets (~55% of total energy from carbohydrate) increased postprandial plasma glucose, insulin, and triglycerides when compared with high–monounsaturated fat diets. However, high–monounsaturated fat diets have not been shown to improve fasting plasma glucose or HbA_{1C} values. In other studies, when energy intake was reduced, the adverse effects of high-carbohydrate diets were not observed (59, 60). Individual variability in response to high-carbohydrate diets suggests that the plasma triglyceride response to dietary modification should be monitored carefully, particularly in the absence of weight loss.

Diets high in polyunsaturated fatty acids appear to have effects similar to monounsaturated fatty acids on plasma lipid concentrations (61–63). Very-long-chain n-3 polyunsaturated fatty acid studies in individuals with diabetes have primarily used fish oil supplements. Consumption of ω-3 fatty acids from fish or from supplements has been shown to reduce adverse CVD outcomes, but the evidence for α-linolenic acid is sparse and inconclusive (64). In addition to providing n-3 fatty acids, fish frequently displace high–saturated fat–containing foods from the diet (65). Two or

more servings of fish per week (with the exception of commercially fried fish filets) (66, 67) can be recommended.

Protein in diabetes management

For individuals with diabetes and normal renal function, there is insufficient evidence to suggest that usual protein intake (15–20% of energy) should be modified (35, 68-70). In individuals with type 2 diabetes, ingested protein can increase insulin response without increasing plasma glucose concentrations. Therefore, protein should not be used to treat acute or prevent nighttime hypoglycemia. High-protein diets are not recommended as a method for weight loss at this time. The long-term effects of protein intake >20% of calories on diabetes management and its complications are unknown. Although such diets may produce short-term weight loss and improved glycemia, it has not been established that these benefits are maintained long term (35, 68-70).

Optimal mix of macronutrient

Although numerous studies have attempted to identify the optimal mix of macronutrients for the diabetic diet, it is unlikely that one such combination of macronutrients exists. The best mix of carbohydrate, protein, and fat appears to vary depending on individual circumstances. For those individuals seeking guidance as to macronutrient distribution in healthy adults, the Dietary Reference Intakes (DRIs) may be helpful. The DRI report recommends that, to meet the body's daily nutritional needs while minimizing risk for chronic diseases, healthy adults should consume 45–65% of total energy from carbohydrate, 20–35% from fat, and 10–35% from protein (35). It must be clearly recognized that regardless of the macronutrient mix, total caloric intake must be appropriate to weight management goals. Additionally, the above ranges should be modified, as needed, based on the considerations noted above for each macronutrient group.

Alcohol in diabetes management

If adults with diabetes choose to use alcohol, daily intake should be limited to a moderate amount (one drink per day or less for women and two drinks per day or less for men). One alcohol containing beverage is defined as 12 oz beer, 5 oz wine, or 1.5 oz distilled spirits. Each contains ~15 g alcohol. To reduce risk of nocturnal hypoglycemia in individuals using insulin or insulin secretagogues, alcohol should be consumed with food. In individuals with diabetes, moderate alcohol consumption (when ingested alone) has no acute effect on glucose and insulin concentrations but carbohydrate coingested with alcohol (as in a mixed drink) may raise blood glucose (35, 71). In individuals with diabetes, light to moderate alcohol intake (one to two drinks per day; 15–30 g alcohol) is associated with a decreased risk of CVD. The reduction in CVD does not appear to be due to an increase in plasma HDL cholesterol. The type of alcohol-containing beverage consumed does not appear to make a difference (71).

Treatment and management of CVD risk

Target HbA_{1C} is as close to normal as possible without significant hypoglycemia. For patients with diabetes at risk for CVD, diets high in fruits, vegetables, whole grains, and nuts may reduce the risk. In normotensive and hypertensive individuals, a reduced sodium intake (e.g. 2,300 mg/day) with a diet high in fruits, vegetables, and low-fat dairy products lowers blood pressure. In most individuals, a modest amount of weight loss beneficially affects blood pressure. Observational data from the UKPDS suggest that CVD risk in type 2 diabetes is also proportionate to the level of HbA_{1C} elevation (35, 72).

However, because CVD risk factors are similar in individuals with and without diabetes, benefits observed in nutrition studies in the general population are probably applicable to individuals with diabetes. The previous section on dietary fat addresses the need to reduce intake of saturated and *trans* fatty acids and cholesterol.

Hypertension, which is predictive of progression of micro- as well as macrovascular complications of diabetes, can be prevented and managed with interventions including weight loss, physical activity, moderation of alcohol intake, and diets such as DASH (Dietary Approaches to Stop Hypertension). The DASH diet emphasized fruits, vegetables, and low-fat dairy products; included whole grains, poultry, fish, and nuts; and was reduced in fats, red meat, sweets, and sugar-containing beverages (73, 74, 75). The effects of lifestyle interventions on hypertension appear to be additive. Reduction in blood pressure in people with diabetes can occur with a modest amount of weight loss, although there is great variability in response (21, 73). Regular aerobic physical activity, such as brisk walking, has an antihypertensive effect (73). Although chronic excessive alcohol intake is associated with an increased risk of hypertension, light to moderate alcohol consumption is associated with reductions in blood pressure (73).

Carbohydrate counting in people with diabetes

Carbohydrate counting is useful for all people with diabetes. Some individuals will benefit from simply knowing which foods are carbohydrates and how many servings of foods containing carbohydrate to select for meals and/or snacks. Emphasis is placed on the total amount of carbohydrate rather than the source or type. One carbohydrate choice contains 15 grams of carbohydrate. Foods that contain carbohydrate are starches, starchy vegetables, fruits, milk, and desserts.

Table 2.2 lists examples of common carbohydrate servings (19, 76-79). Vegetables also contain carbohydrate but generally in smaller amounts. The green and leafy vegetables only count as a carbohydrate if large amounts are eaten, such as a lunch that consists primarily of a large salad or a plate of cooked vegetables. However, starchy vegetables such as potatoes, pumpkins, or corn are considered carbohydrate serving. A free food is defined as any food or drink that contains less than 20 calories and 5 g or less of carbohydrate per servings.

Table 2.2 Examples of carbohydrate servings (19, 76-79)

1 carbohydrate serving =15 g of carbohydrate = 1 carb choice

Starch

- 1 slice bread
- 1/3 cup rice
- 1/4 cup sticky rice
- 3/4 cup dry cereal
- 1/2 cup noodle

Starchy Vegetables

- 1/2 cup corn or a 5-6″ cob
- 1/2 cup mashed potatoes
- 1/2 cup green peas
- 1 small (2″ or 3oz) baked potato
- 1 cup cooked pumpkin

Fruit

- 1 apple or other small fresh fruit
- 1 medium guava
- 1/2 medium banana
- 12-15 grapes or strawberry
- 1/2 cup juice

Milk and yogurt

- 1 cup fat free and reduced fat milk
- 6 oz. cup yogurt, plain

Sweets/Desserts

- 1 brownie, 2″×2″
- 1 cake, 2″×2″
- 3 cookies, 1″ across
- 1/2 cup ice cream
- 1 tbsp honey, table sugar, regular jam or syrup

Combination/Mixed Foods

- 1 slice (⅛ pizza) medium, thin crust, pizza
- 1 cup soup: cream, noodle, rice, vegetable

Note: If you eat 1 ½ cups cooked or 3 cups raw nonstarchy vegetables at a meal, that is equal to one carbohydrate choice.

Individuals need to know how many carbohydrate servings to choose for meals or snacks, if needed or desired. A typical food/meal plan for adults with type 2 diabetes may start with 3 to 4 carbohydrate servings (45 to 60 gm) per meal for women, 4 to 5 carbohydrate servings (60 to 75 gm) per meal for men, and 1 to 2 servings (15 to 30 gm) for 1 snack. Table 2.3 lists general food plan guideline for meals among men and women. Food records and blood glucose monitoring data can then be used (77). In most cases, consistency of carbohydrate intake will reduce

fluctuations in postprandial glucose levels. When variation in carbohydrate intake is desired, individual can be taught to adjust medication to maintain target blood glucose levels. When using carbohydrate counting, the protein and fat content of foods must be considered because of the calories they contribute and, therefore, the potential for weight gain. In usual amount, however, protein and fat have minimal effects on blood glucose levels (19). Furthermore, food labeling should be provided to persons with diabetes how to prioritize information. The serving size and total carbohydrate should be reviewed.

Table 2.3 Food plan guideline for meals among men and women (77)

Sex	To lose weight	To control weight	For the very active
Women	2-3 choices	3-4 choices	4-5 choices
Men	3-4 choices	4-5 choices	4-6 choices

The three steps of carbohydrate counting are

Step 1: Identifying carbohydrate foods

Step 2: Identifying a carbohydrate choice

Step 3: Counting choices in a meal

The plate model: A visual method of teaching meal planning

The plate model is a visual method of promoting healthful eating through the use of a picture of a plate to illustrate meal planning. The nutrition message is delivered by simply showing examples of healthful meals consistent with the client's general food preference. The centerpiece of the model is the dinner plate, which serves as a pie chart to show the proportions of the plate that should be covered by foods from difference food groups. The model may include portrayal of side dishes, beverages, and other courses of the meal or depict an entire day's meals and snacks. A 45-min counseling session is sufficient time to teach a new client a plan for healthful eating (80). Using only 5-minute promote this method (81). Visual stimulation, which improves memory (82), enhances the likelihood that a nutrition counselor can devote time to questions and topics relevant to the client rather than following a counselor-led agenda. Topics that have been inspired by depicting example meals are methods

of cooking; ingredients, specifically what fats to use; consideration of whether dessert can be part of the meal; and identification of appropriate beverages. The discussion of types and amounts of fats derive from looking at the specific foods in the picture and asking the client whether fat would be added to foods in preparation or at the table. This leads to a general discussion about kinds of fats (80).

PART 2: Theories and concepts

2.5 Lifestyle Counseling Strategies for Behavior Change

2.5.1 Approaches to education

The compliance-based approach to diabetes patient education is intended to improve patient adherence to the treatment recommendations of healthcare professionals. This approach is based on the assumption that healthcare professionals are diabetes care experts and that patients should comply with their recommendations regarding diabetes self-care. Patient education is seen as a means for influencing patients to follow treatment recommendations to improve their glucose control and prevent the short- and long-term complications of diabetes (83, 84). In the *empowerment-based approach*, the primary purpose of diabetes self-management education is to prepare persons with diabetes to make their own decisions in diabetes care. This approach assumes that most people with diabetes are responsible for making important and complex decisions while carrying out the daily treatment of their diabetes. Patients are the ones who experience the consequences of having and treating diabetes, they have both the right and responsibility to be the primary decision makers regarding their own daily diabetes care. However, most educators usually use some combination of the two approaches based on their own values and understanding of the purpose and methods of patients education (83, 85-88).

2.5.2 Characteristics of adult learners

Adults are usually self-directed and must feel a need to learn before they are able to participate fully in the educational process. They tended to be problem-oriented learners rather than subject-oriented learners. They usually want to acquire information that will help them solve specific diabetes problems rather than complete a comprehensive study of the subject of diabetes. Furthermore, adults lean better when their own experience with diabetes is incorporated into diabetes education, including their past experiences and consideration of how these experiences will apply to their learning in the future. In addition, adults usually prefer to participate actively in the learning process rather than remain passive (83, 89).

2.5.3 The transtheoretical model (TTM): stage of change

The transtheoretical model was developed by Prochaska and DiClemente to describe the readiness to change (90). There are precontemplation, contemplation, preparation, action, maintenance, and relapse stages.

- *Precontemplation stage*: At this stage, clients at this stage have no plans to make any changes in their current behavior. Although many people know a lot about the relationship between diet, exercise, and health, a particular client may have significant misinformation (90). The major goal of working with clients is to raise awareness of the health/diet problems related to dietary pattern (91).
- *Contemplation stage:* At this stage, client has at least begun to think about making changes. A diet change is possible. Might be occurred within the next 6 months. They know the problem exists but something is needed to push the decisional balance in favor of making a change. The objective of working with people at this level is to build confidence in their ability to make a diet change, and the major task is to explore and resolve ambivalence (low confidence) (91).

- *Preparation stage:* A client at this stage intendeds to take action within the next 30 days and may begin to take some behavioral steps to get ready for action. The psychological task at this stage is to ensure that clients come to the conclusion that they have the ability and knowledge necessary to make a change. The positive reinforcement is a key motivational strategy (90).
- *Action stage:* In this stage, clients have determined that they need to make a change, and, with help, they have selected a small step that will produce real progress toward the ultimate goal. Clients may already have done many small preparatory steps, but they have not become accustomed to the new behavior pattern. Researchers have determined that any changes that have not persisted for at least 6 months should still be considered transient and characterized as part of the action stage (90).
- *Maintenance stage:* A client reaches this phase when the attempted behavior change has been sustained for more than 6 months (90). The dietetic role is increasing awareness of possible alternatives for solving problems and facilitate decision making.
- *Relapse stage:* It should be in a part of process and not something to be avoided or feared. A potential destructive aspect of a therapeutic relationship is the guilt associated with relapse. Clients neglect to tell counselors that they have not been able to keep to their goals because they do not want to disappoint or they fear recrimination. Therefore, clients usually avoid coming for follow-up or fail to keep or bring in their food diaries in an effort to avoid the expected admonishment of their clinicians (90). Building confidence and increasing motivation to make diet changes are the keys strategies to explore and resolve ambivalence.

2.6 Diabetes self-management education (DSME)

The primary purpose of diabetes education are to provide knowledge and skill training, help individuals identify barriers, and facilitate problem solving, and coping skills to achieve effective self-care behavior and behavior change (92). The standards for outcomes measurement of diabetes self-management education is showed in Table2.4.

Table 2.4 Standards for outcomes measurement of diabetes self-management education

1. Behavior change is the unique outcome measurement for diabetes self-management education.
2. Seven diabetes self-care behavior measures determine the effectiveness of diabetes self-management education at individual, and population level **(Table5).**
3. Diabetes self-care behaviors should be evaluated at baseline and then at regular intervals after the education program.
4. The continuum of outcomes, including learning, behavioral, clinical, and health status, should be assessed to demonstrate interrelationship between DSME and behavior change in the care of individual with diabetes.

Table 2.5 Diabetes self-care behaviors

1. Being active: physical activity (exercise)
2. Eating
3. Medication taking
4. Monitoring of blood glucose
5. Problem solving especially for blood glucose: high ,low levels, and sick days
6. Reducing risks of diabetes complications
7. Living with diabetes (psychosocial adaptation)

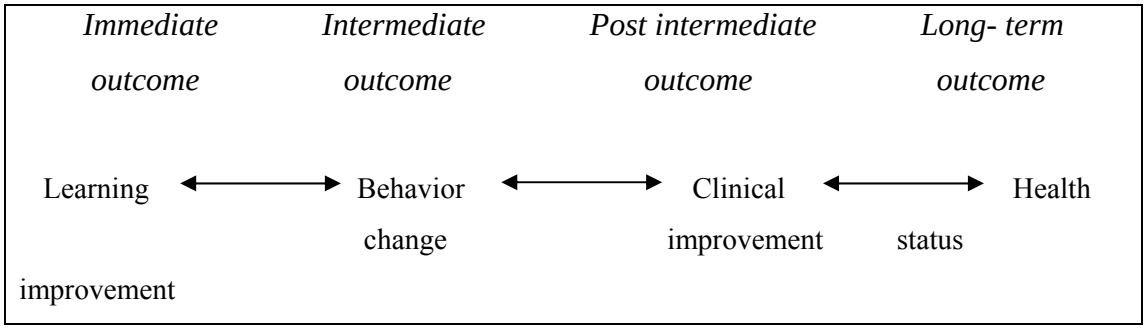

Figure 2.1 Continuum of outcome categories

2.7 The empowerment approach for facilitating behavior change

Facilitating the empowerment of individuals for self-directed behavior change is gaining increased support in diabetes education (83). Therefore, planning for teaching patient empowerment needs well-planned program. It depends on educator philosophy, facilitator training, team teaching, program orientation, criteria for participant selection, and key ingredients for implementation (93).

The key ingredients for implementing the empowerment approach are creating a psychologically safe environment for personal reflection and sharing. People can learn from talking about their own experiences. Accept our role as educators and facilitators, not therapists. The following suggestions can help create an environment in which clients can begin to evaluate what their goals are and what they are ready to do about achieving these goals (93):

- Avoid giving advice.
- Accept, acknowledge, and avoid attempts to change participants' feeling about or perception of their experience.
- Emphasized the confidentiality of individual discussions.
- Share personal stories to illustrate points and model storytelling.
- Communicate acceptance with all comments.

No limitations on age or duration of diabetes have been suggested by our experience. Although the majority of participants were older (mean ages = 51 years), had experience living with diabetes (mean durations = 11.5 years), were female (67%), and had non-insulin dependent diabetes mellitus (Type 2 diabetes) (68%), there was considerable diversity. The majority of participants had some college (77%) and 85% had completed a diabetes education program. Theoretically, the empowerment philosophy is an appropriate approach for any group regardless of cultural heritage or literacy level. However, the study of Arnold et al reported that it probably would not benefit for younger children and mental impaired adults because of requiring some level of thinking. In addition to this study, benefit from or appreciation of the empowerment program did not appear to be related to demographic factors (93).

Rubin RR and Napora JP demonstrated that twelve specific steps for facilitating patient empowerment were helpful for related healthcare professionals such as diabetes educators and dietitians (94). Asking open-ended questions can actually save time for healthcare professionals and clients (94). It is a waste of valuable time when the educators attempt to offer recommendations without knowing what their concerns are and often end up making suggestions that have little meaning for clients. Therefore, both the professional and client often become frustrated. Starting with the client's agenda increases the achieving in critical self-care goals. A more positive relationship is established, and clients are likely to become more open when they see that their needs are the educator's primary concern (94). Individualize the treatment plan and identify the problem as specifically as possible. The key to successful individualization is a fundamental tool: good questions (95). The next process is to take a step-by-step approach. The important role of educator is to help patient generate a list of positive strategies, assist in using the list to create a meaningful plan, and provide emotional encouragement and practical support for the patient's efforts to change behavior (94).

Living well with diabetes requires a high level of problem-solving skills. Diabetes makes life more complicated, so people with diabetes have more decisions to make and problems to solve on a day-to-day basis than people without diabetes (96). Patients develop diabetes-related problem solving skills through trial and error, training, and continuous practice (94). The educator can support the patient's effort to solve a problem by asking what lessons learned from their experiences, whether the effort was successful or not (85, 94, 97). The concept of experiments was used in empowerment program because it inspires the importance of learning from the experience rather than succeeding or failing. Focus on behaviors, not outcome (94, 97). One of the strategies used to assist participants to solve problem was to identify costs or barriers and benefits of common concerns or problems (97). Problem solving was also related to self-management behaviors (eating and exercise patterns), biological variable (HbA_{1c} and lipids), and most strongly related to distress related to one's regimen by psychosocial measure (Diabetes Distress Scale) (97).

Goal setting is an effective way to focus attention on behavior change (98). Theoretically, frequency of goal setting may indicate the level of commitment to diet and physical activity behavior change. Frequent goal setting that is focused specifically on diet or physical activity was more predictive of using dietary or physical activity strategies, respectively, than goal setting focused on weight loss overall (98). A large literature suggests that goal setting is effective for enhancing the initiation and maintenance of new behaviors (99). It has been consistently demonstrated across multiple settings and contexts that individuals who set specific challenging goals are more likely to achieve success than are those who set more general or "do-my-best" goals (99). In addition to setting specific and challenging goals, there is evidence that self-selected or collaboratively set goals might be more motivational than goals that are assigned by a superior, physician, or peer (99). Furthermore, when participants are provided with information on health behavior status and an option of behavioral goals for managing type 2 diabetes, they will select personally appropriate goals, resulting in significant behavioral changes over a 6-month period (100). Therefore, goal setting intervention appears to promote dietary change, dietitians should consider incorporating the goal-setting strategies to enhance the behavior change process in nutrition education programs (101).

Diabetes is a family disease powerful enough to influence lifestyle especially in food habit for people with diabetes. Family members and other important people in the patient’s life can significantly affect the way a person with diabetes lives with the disease. Getting the perspective of family members can be helpful to the patients and healthcare professionals (94). Family and social support have many levels and types, and one model (102) proposes a holistic approach that involves the patient’s total life space. This model noted that “support” in the form of advice (however well intentioned and caring) can be problematic when it is perceived as judgmental or blaming.

Some potentially effective approaches for maintaining patient contact are through phone calls, postcards, newsletters, e-mail messages, and office-based support groups. Maintaining contact helps patients feel cared for, enhances motivation, and provides the healthcare professional with an invaluable early-warning system

before it takes placed (94). Following the empowerment approach, diabetes educators or dietitian also need help and support from others related specialized professionals or consulting with a colleague to get suggestions for dealing with a difficult issue.(94). For example, in case of a stressful life situation and insufficient coping are obstructing behavior change.

Anderson and Funnell suggest that breaking the empowerment process into five distinct steps makes it easier to understand and to learn (85). The five steps in the empowerment-based approach are:

1. Identify the problem
2. Explore feelings
3. Set goals
4. Make a plan
5. Evaluate the result

The behavior-change tips are :

1. One step at a time.
2. Easy does it.
3. Take small steps.
4. Do not go it alone. (Ask for support.)

CHAPTER III
MATERIALS AND METHOD

3.1 Study Design

This research was a pre-experimental design research, with one group before and after treatment, to study the effectiveness of the individualized empowerment approach in dietary self-management education in type 2 diabetes on the changes of dietary behavior, ability to manage dietary risk situations and in metabolic control. The main metabolic outcome was a reduction of HbA_{1c} by 2 percent points or more. The techniques used were individual education and counseling including data collection sessions, informal small groups' discussion and telephone follow-up after the study period and interviewing by using questionnaire. The intervention consisted of 6 visits; one 2-hour at the first visit, two 45-minute biweekly, and three 30-minute monthly individual education, counseling, and data collections for a total duration of 5 hours. No lectures were used, and the content was determined by participants' questions and concerns. Written educational materials were also provided. The time spent for this research was one year starting from November 2005 to November 2006.

3.2 Population and Sample Selection

3.2.1 Population

Study participants were persons with type 2 diabetes treated with oral hypoglycemic agent (OHA) and/or insulin therapy, who responded to directed-contacts, letters, telephone contacts, hospital advertisement, hospital's employee, social group such as diabetic club, and diabetic class at Theptarin General Hospital Diabetes Center, Bangkok.

3.2.2 Hospital / diabetes center/ patient education and counseling

Theptarin General Hospital is an 80-bed-private hospital enabled to serve clients with complete facilities including diabetes center, and education service and research center. The diabetes center provides services everyday with endocrinologists and medical doctors. Diabetes educators, dietitians, and physical therapists are vital members of the diabetes teams. They believe that education is a very important success key to best healthcare service.

Theptarin offer a regular diabetes course for clients on diabetes and self-care by diabetes educators, followed by a session on exercise and also an ultimate behavior modification activity, the Theptarin Diabetes Camp. Here, participants not only acquire classroom knowledge, but also put that knowledge into practice through creative and well-planned activities. A study of participants' hemoglobin A1C levels shows that they achieve better glucose control after attending the camp. However, the effect has not been permanent, indicating behavior modification activities need to be reinforced.

In the usual practice, a goal was set by healthcare professionals, not by the client. Occasionally, some healthcare professionals were frustrated by their clients because of no adherence as it was to them. The dietitians were periodically refused to follow up from the clients. The new approach, the empowerment approach and way to provide education and counseling, which the researcher used in this program, had been changed from the previous practice. However, the services and other environment were used the same patterns.

3.2.3 Sampling Technique

The purposive sampling technique was used in this study. The participants would be mainly recruited by self-selection to participate in this study. Three recruitment strategies were used. The first recruitment method was advertisement

posters on the bulletin boards of the hospital and brochures distributing to outpatient clinic and counseling rooms. A second recruitment method was sending an information letter to individuals with type 2 diabetes who had HbA_{1c} level greater than 8 percent in the past 3 months. The third recruitment strategy was directly contacted to candidate. The participants who passed the inclusion criteria and medical check up by their private doctors were enrolled into the study and assigned to immediate intervention.

3.2.4 Sample Size

The outcome variable was HbA_{1c} after 16-week of intervention. According to a previous study, Robert M. Anderson.et al; 1995, had reported that the mean reduction of HbA_{1c} in the intervention group was -0.7 percent point with a standard deviation of 2.89 %. A difference of -1.7 percent points or more in mean reduction of HbA_{1c} between before and after was used to estimate sample size per group (n) at α (two-tailed) = 0.05, calculated β and power of 0.2 and 80%, respectively according to the following formula was 30 participants.

When...α = 0.05

β = 0.2

σ^2 = 2.89

Power = 80%

The two-tailed Z value related to α was 1.96 ($Z_{\alpha/2}$)

The one-tailed Z value related to β was 1.28 (Z_{β})

n pair = $(Z_{\alpha/2} + Z_{\beta})^2\sigma^2/d^2 = (1.96 + 1.28)^2\ (2.89)^2/\ (1.7)^2$ = 30/group

3.2.5 Inclusion Criteria

- T2DM without serious complication
- HbA_{1c} > 8.0 %
- Any age
- On diet control or OHA and/or insulin therapy
- Participants who agreed to participate into this study

3.2.6 Exclusion Criteria

Patients who demonstrated the following medical conditions were excluded from the study.

- Acute myocardial infarction,
- Significant ischemic heart disease
- Congestive heart disease
- Other serious illness i.e. cirrhosis, active TB, HIV, AIDS, cancer, liver
- Patients who
  - Intentionally/unintentionally lose weight >10% during the past 6 months
  - Pregnant or childbearing
  - Demonstrate psychological disorder
  - Consume excessive alcohol both acute and chronic
  - Have any serious infection or stress occurred during the study

3.2.7 Discontinuation of the study

The participants were discontinued if they developed any serious medical conditions, who declined to participate in this study, or who could not keep the appointment within the 2 weeks time-frame period.

3.3 Research Instrument

3.3.1 Instrument for Collecting Data

Data Collection Forms and Questionnaires (see in the Appendix1)

(a) Anthropometric measurement and biochemistry record forms

(b) Portable personal goal card: A personal goal card was a card-size folder with four folds and had four blank lines for participants to write down

their goals as well as the weekly check-boxes for participants to check whenever any goal was achieved each day. It was provided to each participant at every visit after the empowerment approach by engaging in systematic client-centered dietary goal setting and problem solving.

Participants were much more likely to be motivated to address their own concerns, priorities, and behaviors rather than to accept the choices determined by the researcher. Problem solving also led to skill development in carbohydrate counting together with plate method. During a discussion about their own goal setting, the participants were asked what percentage of the success in each goal they probably reached, in pragmatics; the researcher had a desire for them to rethink about the feasibility of those goals.

In every follow-up visit, the personal goal card of each individual would be discussed with the researcher, about the success in percentage the participants achieved in each goal**.** In case of any goal being achieved, we would encourage participants to continue or to set a new goal. In contrast, if participants did not reach their own goals, we would give confidence and encouragement by saying that small change might make a big difference.

Accordingly, we asked the participants about the way to achieve goal modification or goal maintenance. Goal cards provided to participants dividing into 5 periods, week2; week4; week8; week12; and week16 respectively. Period 1 and 2 as well as period 3, 4, and 5, had totally 14 and 28 days in each period respectively. After each visit, the number of days achieved were tabulated by the researcher and demonstrated into the percentage of achieving.

(c) 3-day food record form: Food records involved writing down food items and serving size soon after they were eaten for a specified period of time (3-day before the follow-up). The food record forms were provided to the participants after

each visit and followed by discussion in the next visit. INMUCAL for energy and macronutrient intake analysis was used.

(d) Demographic information questionnaire: It was a self-administered questionnaire. This questionnaire was composed of socio-demographic data regarding sex, age, education level, marital status, occupation, income, duration of diabetes, treatment regimen, acute and chronic complication of diabetes, attending of dietary education and counseling session, and rating score about understanding in dietary self-management.

(e) Problem solving dietary scenarios test (PSDS Test): A set of 5-open-ended questionnaires asked about dietary problem solving to specific situations and focusing on dietary self-management. It measured the ability to solve dietary problems in specific situations. Participants were asked to describe how they would react to each scenario and prompted for a coping strategy for each situation. At baseline and after 16-week of intervention, participants completed a PSDS test. The 5-open-ended questionnaires are shown in Appendix1.

The parallel answers from PSDS test were grouped after intervention. All of the grouped-answers validated by the researcher, one of the thesis committee and the experts and divided into 4 levels of point score. The score points of problem-solving ability were based on coping strategy in dietary problem situations modified from Glasgow RE et al (117) and on levels of development of thinking developed by Keeratiyutawong (123). An overall problem-solving rating for each situation on a 4-point scale (from 0 = poor strategy to 3 = excellent strategy) was provided. A 0-3 scoring system was developed as the following scoring criteria:

Criteria	Score
Poor strategy	0
Moderately well strategy	1
Good strategy	2
Excellent strategy	3

A rating of 0 point was assigned if nothing was done to improve the dietary problem situation or if a strategy produced a detrimental effect. A score of 1 point was assigned if a small amount of strategy was done to improve the dietary situation or if a strategy produced awareness and trial-and-error effect in which a negative problem-solving decision was observed. A score of 2 or 3 points was assigned if strategies included trying out different ways of overcoming barriers to dietary goals, planning ahead and flexibility in carrying out the regimen activity, and a positive problem-solving decision was observed. However, the score of 3 points demonstrated more consistent in taking action than the 2 points score.

(f) Semi-quantitative Food Frequency questionnaire (Semi-FFQ): Semi-quantitative FFQ was a self-administered instrument that listed common foods by food groups. The response frame was designed to elicit how many serving (s) and frequently listed items were consumed with the use of food model. In this study, we developed semi-quantitative FFQ which had 165 items covering 28 food groups and 9 frequencies ranging from never or ≤ 3 times per month to > 3 times per day. An open format to add items that might be frequently consumed was included. Food model demonstration was displayed before completion the semi-quantitative FFQ under the research content areas; food exchange with portion size, carbohydrate counting, and plate model. Participants completed a semi-quantitative FFQ at baseline and 16-week after intervention.

With the number of serving (s) consumed per time and frequency of consumption of certain food groups could be calculated the number of serving (s) per day from the following steps:

(1) Coding the 9 frequencies consumed ranges

Frequency ranges:	**Code (F_i):**
Never	F0
1 time/day	F1
2 times/day	F2
3 times/day	F3
>3 times/day	F4

1-2 times/week	F5
3-4 times/week	F6
5-6 times/week	F7
≤ 3 times/month	F8

F_i = code of frequency by ranges

(2) Computing the 9 frequencies consumed ranges to time (s) per day

Frequencies ranges	**Frequencies consumed per day**
Never	0
1 time/day	1
2 times/day	2
3 times/day	3
>3 times/day	5.5
1-2 times/week	0.2
3-4 times/week	0.5
5-6 times/week	0.8
≤ 3 times/month	0.07

(3) Calculating the number of daily serving (s) of food consumed in different food group

The number of daily serving (s) = QF_i

Q = the number of serving (s) per time

F_i = the frequency of food consumption per day

(g) Anthropometric measurements: Anthropometry is an indirect method of nutritional assessment by body composition. Anthropometric measurement included weight, height, body mass index, waist circumference, triceps skin-fold thickness (TSF), mid-upper arm circumference (MAC), and % tissue body fat were performed according to standard methodology (124, 125, 126).

1. Measurement of body weight (BW): A beam balance was used in this program, calibrated with a specialist of the hospital, and checked for zero-balance

before each measurement. The measurement of weight was preferably done after the bladder had been emptied, and before a meal. The participant was asked to stand unassisted, in the center of the platform, and then be asked to look straight ahead, standing relaxed but still, preferably light underclothing. The presence of visible edema was recorded to the nearest 0.1 kg. The measurement time was noted because diurnal variations in weight occurred.

2. Measurement of height (Ht): The participant was asked to stand straight barefoot on a horizontal platform with heels together, knee straight, and heels, buttocks, and shoulders blades touching measurement board. Arms were hanging loosely at the sides. They were asked to stretch upward to the fullest extension with shoulders relaxed. Height was recorded to the nearest millimeter.

3. Body mass index (BMI): BMI was calculated from the following formula: BMI (kg/m^2) = body weight (kg)/height (m^2)

4. Tricep skinfold thickness (TSF): TSF is the site most frequently used to obtain a single indirect estimate of body fat and using skinfold thickness caliper. The Holtain caliper (manufactured in UK) was used in this study. The participant was asked to stand erect with the feet together and arms at the side. The measurement of the triceps skinfold was performed at the midpoint of the upper left arm, between the acromion process and the tip of the olecranon, with the arm hanging relaxed. To mark the midpoint, the left arm was bended 90° at the elbow, and the forearm was placed palm down across the body. The distance between these two points was measured using a nonstretchable tape, and the midpoint was marked with a soft pen, directly in line with the point of the elbow and acromion process. The left arm was then extended so that it was hanging loosely by the side. The researcher grasped a vertical fold of skin plus the underlying fat, 1 cm above the marked midpoint, in line with the tip of the olecranon process, using the thump and forefinger. The skinfold remained held between the fingers while the measurement was taken. As the jaws compressed the

tissue, the caliper reading generally diminished for 2 to 3 seconds. The mean of three consecutive reading was reported.

5. Mid-arm circumference (MAC): MAC has been use as an indicator of the inadequacy of both caloric and protein store. The arm contains subcutaneous fat and muscle; therefore; a decrease MAC reflects a reduction in muscle mass, a reduction in subcutaneous tissue, or both. Changes in MAC were used to monitor progress during nutritional therapy, correlating positively with changes in weight. Measurement was taken to the nearest millimeter at the same level as the triceps skinfold thickness. At the midpoint of upper left arm between the acromion process of the scapula and tip of olecranon was measured. After locating the midpoint, the left arm was extended so that it was hanging loosely by the side, with the palm placing inwards. The tape was wrapped gently but firmly around the arm at the midpoint.

6. % tissue body fat: Dual-energy x-ray absorptionmetry (DEXA) was used for measuring of fat, bone mineral, and nonbone lean tissue. In this study, DEXA was allowed only measurement of % tissue body fat. DEXA uses a stable x-ray generator and two energy levels as the radiation source. A series of transverse scans was made from head to toe of the participants at 1-cm intervals, with bone mineral and soft tissue composition determined from the differential attenuation of the two energy photon beams. DEXA is safe because of emitting low level of radiation and quick (10-20 min). At the beginning of this study, the detail of DEXA was provided to the participants in the process of signing consent form. Participants were assessed the percentage of body fat at baseline and the end of this study.

(h) Biochemical analysis: The biochemical investigations were provided by central laboratory department of Theptarin (Lab Plus One®) with the standard ISO 17025. In this study, fasting plasma glucose (FPG); HbA_{1c}; and lipid profile [total cholesterol (TC), triglyceride (TG), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C)] were examined at baseline, week8, and

week16, respectively. HbA_{1c} measurement used HPLC method, FPG and lipid profile used enzymatic methods.

3.3.2 Educational tools

Written educational materials were also provided. A version of healthy eating for diabetes established by Thai Association of Diabetes Educator, and a food exchange's pocket guide of Theptarin's version (permission from Sallaya Kongsomboonvej,2007), were provided to all participants by their concerns. These materials were examined and developed by the dietetics expert group of Thai Association of Diabetes Educator committees.

3.3.3 Development and Evaluation of the Instrument

Procedures undertaken for instrument development and evaluation were reviewing of concepts, theories, relevant research, and other related documents. Determination of the key contents that covered all variables used in the study and developed the draft forms and questionnaires. The instrument including portable personal goal card, 3-day food record; demographic information questionnaire; problem solving dietary scenarios (PSDS) test, and semi-quantitative FFQ, were examined the content validity by five clinical dietetics experts, one diabetes educator expert in diabetes self-management education (DSME) and knowledge management (KM), and one of thesis committee. The content validity examination included all questions and corresponding answers according to the research objectives. After the review from all experts, the contents were revised and the modified versions of instruments were developed.

3.3.4 Protection of human study

This study was approved from the Ethical Committee of Theptarin General Hospital for human study. Before signing consent forms and enrolling into the study,

the objectives and the details of this study were discussed and the patient information sheets were provided to all volunteers. The details presented in Appendix7.

3.4 Research Implementation

3.4.1 Preparation Phase

Preparing the site

Activities in this step:

1. Getting approval from the Ethical Committee of Theptarin General Hospital for human study.
2. Collection of names and addresses of the active patients with T2DM who had HbA1c > 8% and treated with oral hypoglycemic agent and/or insulin therapy at OPD, in the DM Club of the hospital, and volunteers from other settings.
3. Advertisements about study information to the target group by making contact directly with candidates, sending letters/ pamphlet advertisements by mail; e-mail; and fax, and conducting posters to put on the bulletin boards of the hospital as well as in the elevators.
4. Candidates who self-selected to participate in this study and met the inclusion criteria were enrolled into this study.

Preparing the Participants

Activities in this step:

At the first visit (week -1)

1. The researcher informed the participants about the research objectives in empowerment-based approach, comparing the difference between conventional and empowerment approach, sharing ideas of the problems that

the researcher found in the past clinical practice as well as the interesting this research. In addition, informing the expected benefits was explained.

2. Patient screening by medical history, physical exam, personnel data collection, anthropometric measurement and biochemical investigation.
3. Obtaining informed consent before enrolling to the study.
4. Participants were asked to fill in their personal data, and the PSDS questionnaires were interviewed by the researcher.
5. Semi-quantitative FFQ was completed by the participants. Before performing it, the details in food exchange and portion size including food model demonstration were explained. Carbohydrate counting and plate method were displayed. All details in dietary knowledge were shown in Appendix 2.
6. Educational tools were provided as required.
7. Body composition and blood test were done including % tissue body fat by Dual Energy X-ray Absorptionmetry (DEXA).
8. Medical check-up was evaluated by their private doctors. Subsequently, their doctors were informed about medication adjustment whenever necessary. Insulin/OHA doses reduction occured when hypoglycemic episode presented.
9. The 3-day food records were distributed to participants for completion and to return to the researcher at the second visit (week 0).

3.4.2 Implementation Phase

At the second visit (week 0)

1. Participants brought 3-day food record back to the researcher for reviewing and calculating the averages distribution of nutrient composition, finishing before the session started.
2. At baseline visit, initial assessment with biochemical (FPG, HbA_{1c}, Lipid profile), anthropometry (BW, Ht, BMI, WC, MAC, TSF, % tissue body fat), and also blood pressure measurement were collected. A self-monitoring blood glucose (SMBG) printout was completed to the participants who had had a glucometer before the beginning of the session.

3. The dietary education and counseling session provided to the participants through the individualized step-by-step empowerment approach.
4. The 3-day food records were distributed to participants for completion and to return to the researcher at the next visit (week 2, 4). Five-step model of empowerment approach was provided (85).

Step 1: Identification of the problems *(Past)*: The participants were assisted to figure out the problems and prioritize them—researchers would begin by saying *"Tell me what's hardest for you about having or caring for diabetes."* Participants were invited to tell their stories—researcher's role was to listen to the clients and ask questions that would help the researcher to understand what the participants needed to obtain from their interactions with the researcher to better manage their diabetes. The participants were helped to understand the true nature or the cause of their problems.

Step 2: Identification of the feelings (*Present):* Participant's feeling was focused on. They were helped to identify and cope with their feelings relating to diabetes and care. Participants were helped to deal with emotion as shown in the reminder boxes.

Step 3: Goal Setting (*Future)*: Participants were helped to determine one or two of high-priority areas that they wished to change (long term goals)The participants were helped to make a plan by identifying behavior change steps (short-term goals) relating to those areas. They were encouraged to make their own decision to choose an easy one (or two) to get start. Participants were asked a series of questions to help them think about their diabetes care efforts and develop a plan. Goal were written in the portable personal goal card that was provided after each visit

Step 4: Making a plan and action commitment (*Future):* The participants were asked to generate a list of all the possible options—that might be effective in helping goal achievement —even if they did not seem appealing or realistic. The participants were asked to eliminate the options that will not work for him or her and prioritize the remaining items. The participants were asked to choose an option and then develop strategies. The participants were asked to examine their commitments.

Step 5: Evaluation of the result, experience and evaluation of the plan (*Future)*: The participants were encouraged to think of their behavior change plan as a series of experiments in order to identify the strategies and techniques that were, and were not, suited to them, and self-learning. The participants were encouraged to apply their self-learning to the next experiences with dietary self-management. The participants were asked to reflect on behavior-change experiments. Educational experiences were tailored to the participants' need (their concerns) and provide educational tools i.e. food exchange guide book. An appointment was conducted at each visit.

At the third and fourth visits (week 2, 4)

1. The 3-day food record and goal card were reviewed by the researcher.
2. During these visits, the anthropometric (BW, Ht, BMI, WC, MAC, TSF), and also blood pressure measurement were collected. A self-monitoring blood glucose (SMBG) printout was completed for the participants who had had a glucometer before the beginning of the session.
3. The dietary education and counseling session provided to the participants through the individualized step-by-step empowerment approach as mentioned previously. At the end of each previous session, participants were encouraged to identify a goal and a behavioral step as a dietary self-management experiment and to then inform the researcher about their plans. Therefore, at the beginning of each of the subsequent sessions, participants were asked to reflect on their dietary experiments rather than succeeding or failure and were encouraged to share with the researcher as desired. In keeping with this approach, the researcher offered no advice about the scope or type of behavioral steps selected. The main role of the researcher was to facilitate by asking questions to assist participants to gain clarity and integrate the results into their dietary self-management. Goal setting was discussed with the participants which goal they desired to continue or modify. A new goal card was provided to participants and made a next appointment to follow-up.

4. The 3-day food records were distributed to participants for completion and to return to the researcher at the next visit (week 8).
5. After finishing these sessions, the number of days achieved their own goal were counted by the researcher.

At the fifth visit (week 8)

1. The 3-day food record and goal card were reviewed by the researcher.
2. At week8, biochemical (FPG, HbA_{1c}, Lipid profile), anthropometric (BW, Ht, BMI, WC, MAC, TSF), and also blood pressure measurement were collected. A self-monitoring blood glucose (SMBG) printout was completed to the participants who had had a glucometer before the beginning of the session.
3. The dietary education and counseling session provided to the participants through the individualized step-by-step empowerment approach as mentioned previously.
4. Goal setting was discussed with the participants which goal they desired to continue or modify. A new goal card was provided to participants and made a next appointment to follow-up.
5. The 3-day food records were distributed to participants for completion and to return to the researcher at the next visit (week 12).
6. After finishing these sessions, the number of days achieved their own goal were counted by the researcher.

At the sixth visit (week 12)

1. The 3-day food record and goal card were reviewed by the researcher.
2. During this visit, the anthropometric (BW, Ht, BMI, WC, MAC, TSF), and also blood pressure measurement were collected. A self-monitoring blood glucose (SMBG) printout was completed for the participants who had had a glucometer before the beginning of the session.

3. The dietary education and counseling session provided to the participants through the individualized step-by-step empowerment approach as mentioned previously.
4. Goal setting was discussed with the participants which goal they desired to continue or modify. A new goal card was provided to participants and made a next appointment to follow-up.
5. The PSDS test, semi-quantitative food frequency questionnaire, and also 3-day foods record, were provided to the participants to complete before the next follow-up visit.
6. After finishing these sessions, the number of days achieved their own goal were counted by the researcher.

At the seventh visit (week 16)

1. The 3-day food record, goal card, PSDS test, and semi-quantitative FFQ, were reviewed and discussed with the participants.
2. At the end of the study, biochemical (FPG, HbA_{1c}, Lipid profile), anthropometric (BW, Ht, BMI, WC, MAC, TSF, and % tissue body fat by DEXA), and also blood pressure measurement were collected. A self-monitoring blood glucose (SMBG) printout was completed to the participants who had had a glucometer before the beginning of the session.
3. The dietary education and counseling session provided to the participants through the individualized step-by-step empowerment approach as mentioned previously.
4. After completion of the study, a small group informal discussion and telephone interview were used to verify their data.

Flow chart of research intervention

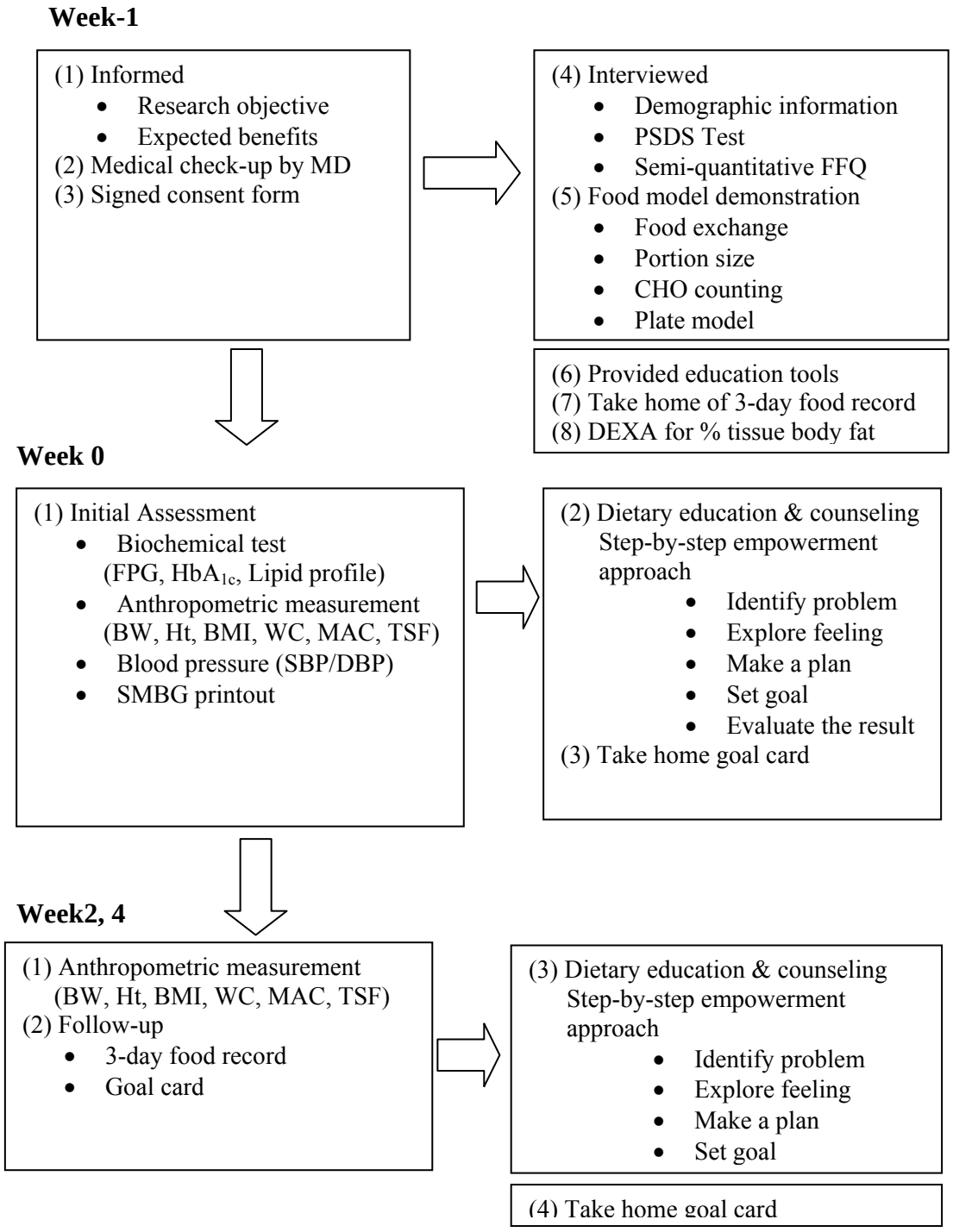

Figure 3.1 Flow chart of the research intervention

Flow chart of research intervention (Cont')

Week8

(1) Biochemical test
(FPG, HbA1c, Lipid profile)
(2) Anthropometric measurement
(BW, Ht, BMI, WC, MAC, TSF)
(3) Follow-up
- 3-day food record
- Goal card

(4) Dietary education & counseling
Step-by-step empowerment approach
- Identify problem
- Explore feeling
- Make a plan
- Set goal
- Evaluate the result

(5) Take home goal card

Week12

(1) Anthropometric measurement
(BW, Ht, BMI, WC, MAC, TSF)
(2) Follow-up
- 3-day food record
- Goal card

(3) Dietary education & counseling
Step-by-step empowerment approach
- Identify problem
- Explore feeling
- Make a plan
- Set goal
- Evaluate the result

(4) Take home
- goal card
- PSDS test
- Semi-quantitative FFQ

Week16

(1) Biochemical test
(FPG, HbA1c, Lipid profile)
(2) Anthropometric measurement
(BW, Ht, BMI, WC, MAC, TSF)
(3) DEXA for % tissue body fat
(4) Blood pressure (SBP/DBP)
(5) Follow-up
- 3-day food record
- Goal card
- PSDS test
- Semi-quantitative FFQ

(6) Dietary education & counseling
Step-by-step empowerment approach
- Identify problem
- Explore feeling
- Make a plan
- Set goal
- Evaluate the result

(7) Informal discussion

3.5 Research Evaluation

3.5.1 Data Collection

The empowerment was processed by using the information from the researcher's "SOAP notes" in the progress note of their medical charts. All instrument included education and counseling sessions, were collected regarding their practices, problems/barriers, feelings, goal setting, and coping with their problems. Goal cards were collected 5 times at the end of the sessions, but only the end of this study, goal settings were analyzed. The main sentences indicating their problems/barriers, feelings, goal setting, and how to cope with them, were recorded in the "SOAP notes".

After the researcher already summarized their information, small groups' informal discussion and telephone follow-up were used to verify their data. It was performed at the end of this study. Lab tests and body composition were collected in the research form. Lab tests included fasting plasma glucose (FPG), glycosylated hemoglobin (HbA_{1c}), and lipid profile, performing three times at weeks 0, 8, and 16. Body composition were composed of body weight, height, body mass index (BMI), waist circumference (WC), mid-arm circumference (MAC), tricep-skinfold (TSF) thickness, and the percentage of tissue body fat, evaluating every visit. Only % of tissue body fat was assessed twice, before and after intervention. The 3-day food records were collected at every visit but the analyses used twice, before and after intervention. The FFQs were also collected twice. The PSDS Tests were collected twice, before and after intervention by using both questionnaires and interviewing.
Personal data were collected by the questionnaire at the beginning of the study.

3.5.2 Data Analysis

All data were analyzed using the Statistical Package for the Social Sciences/personal Computer (SPSS/PC), for window version 15.0. Data were expressed as means ± SD. Paired t-test for continuous variables and chi-square test for categorical variables were used to detect the difference between two groups at

baseline and follow-up. Wilcoxon Signed ranks Test was used for abnormal distribution. In clinical practice, intention to treat analysis was used as complete case analysis, which all data from all participants were included in the final analyses and the imputation method used for dealing with missing observations were the Last Observation Carried Forward (LOCF) analysis in which the last observation obtained from a participant was substituted for all subsequent observations. For the nutrient composition and dietary intake from different food groups were reported by median with the interquartile range (IQR) indicating the distance between the 75^{th} percentile and the 25^{th} percentile. A p-value < 0.05 indicated significant.

3.5.3 Target outcomes of program success

From the study of Lemon C et al (32), the selected outcome indicators of nutrition counseling with dietary self-management was the decrease of HbA_{1c} by 1.7% points. Since the participants in this study had had previous nutrition education; and were well-educated. Thus, the first selected outcome indicator for this study was the decrease of HbA_{1c} by 1.7% points and the success of the outcome was aimed at 80% achievement. The second selected outcome indicator was goal achievement rate in which ≥ 80% was the target outcome achievement (Table3.1).

Table3.1 Target outcome achievement for the selected outcome indicators

Selected outcome indicators	Target outcome achievement
HbA_{1c} decreased ≥ 1.7% points	80%
Goal achievement	≥ 80%

CHAPTER IV
RESULTS

All participants showed a broad array of small to modest positive changes that were maintained or improved during the 16-week follow-up period. The 3 out of 30 participants who had had hypoglycemic episode; therefore insulin doses were declined. In spite of insulin doses reduction, the HbA_{1c} declined. There were not increased insulin/OHA doses in these participants during the intervention. Twenty-two out of 30 participants completed the 16-week study, 6 of the participants dropped out and 2 of the participants discontinued (2 men and 6 women) (Table4.1). Participants not completing the study did not differ from those who completed the study in any of the characteristics at baseline.

Table 4.1 Reasons for participants who dropped out or discontinuation

Events	Reasons (for drop out or discontinuation)	Number of participants	Time period
Dropped out	- severe depression	1 (man)	Week2
	- lost to follow-up	2 (women)	Week2
	- failure in putting effort into dietary self-care	2 (women)	Week2
Discontinued	- bipolar disorder	1 (man)	Week8
	- accidentally bone fracture	2 (women)	Week8

Compared with before intervention, almost all of the participants achieved their own goal setting after intervention. Furthermore, the study showed positive changes of the problem solving score in specific dietary scenarios related to empowerment approach.

The results from this study are presented in six parts: 1) general characteristics of the participants; 2) the participants' rating score about understanding of dietary self-management; 3) the applicability of dietary knowledge to specific situations and problem solving; 4) goal achievements; 5) the changes in nutrient intake; 6) metabolic control; and 7) the changes in HbA_{1c} level at 3-month after finishing the research protocol.

4.1 General Characteristics of the Participants

4.1.1 Background Characteristics of the Participants

Participants were characteristic and representative of people with type 2 diabetes at Theptarin. Of the 30 participants, ages ranged from 30 to 59 years with a mean age of 52.4±9.8 years, female predominated at 60% (Table4.2). Generally, the study participants were apparently overweight with the mean BMI of 27.7±5.2 kg/m^2, waist circumference of 93.2±12.5 cm, and body fat of 40±11 % respectively (Table 4.2). The majority of the participants had a greater than or equal to bachelor's degree (63.3%). Their income was relatively high of ≥ 50,000 baht per month (40%) and ranges from 10,000 to 30,000 baht per month (30%). The major source of their incomes came from their small businesses (63.3%). Participants had been diagnosed with type 2 diabetes for the average of 11.8±8.3 years, 56.7% of the patients had been diagnosed for greater than or equal to 10 years, 46.7% had known hypertension, and 40% were hypertriglyceridemia. Most participants (63.3%) were taking an oral hypoglycemic agent (OHA) only or insulin only (6.7%), while 26.7% had been on both OHAs and insulin (Table4.3). Seven out of thirty participants (23.3%) had experienced hypoglycemia. A large percentage of the participant (56.7%) owned a glucometer at home, but only 33.3% owned and regularly used at home.

Table 4.2 Demographic characteristics of the participants at baseline

Characteristics	(n=30)
Sex: Male (%), Female (%)	12(40%), 18(60%)
Age (y)	52.4±9.8[1]
:30-59 yrs	23(76.7%)
:≥60 yrs	7(23.3%)
Education :< Bachelor degree (%)	11(36.7%)
: ≥Bachelor degree (%)	19(63.3%)
Career : unemployed (%)	8(26.7%)
: Small business (%)	19(63.3%)
: employed (%)	3(10%)
Monthly Income	
:< 10000 baht (%)	3(10%)
: 10,000 – 30,000 baht (%)	9(30%)
: 30,000 – 50,000 baht (%)	6(20%)
: ≥ 50,000 baht (%)	12(40%)
Duration of T2DM (y)	11.8±8.3[1]
:< 10 yr	13(43.3%)
:≥ 10 yr	17(56.7%)
Treatment regimen*	
: OHA (%)	19(63.3%)
: OHA & Insulin (%)	8(26.7%)
: Insulin (%)	2(6.7%)
Diabetic Complication	
: Hypoglycemia (%)	7(23.3%)
: Hypertriglyceridemia (%)	12(40%)
: Hypertension (%)	14(46.7%)

[1] Values are means±SD. * Diet control alone (n=1)

Table4.3 Treatment regimen of the participants

Treatment regimen	Number of participants (N=30)
OHA:	19 (63.3%)
Sulfonylurea	21 (70%)
Biguanide (Metformin)	25 (83.3%)
Alpha-glucosidase inhibitor	5 (16.7%)
TZD	10 (33.3%)
TZD with Metformin	1 (3.3%)
Insulin:	10 (33.3%)
OHA with insulin	8 (26.7%)
Insulin alone	2 (6.7%)
Diet control alone	1 (3.3%)

4.1.2 Baseline Biochemical Parameters

The mean of fasting blood glucose (FBG) and HbA1c level were 179±69 mg/dl and 9.4±1.0 %, respectively at baseline. One participant exhibited a very high serum level of triglyceride (TG) (TG = 4568 mg/dl) while the mean value was 310±811 mg/dl (Table 4.4).

4.2 Changes in Participants' Rating Score about Understanding of Dietary self-management

In this study, a score rating from 0 to 100 was used to test twice their understanding of dietary self-management for diabetes, before and after intervention. At the end of the intervention, the scores were significantly higher than the beginning of the study ($P<.001$). An improvement of post-test score after comparing to the pretest score to 84% from 62% was observed (Table 4.5).

Table 4.4 Mean±SD of baseline biochemical and anthropometric parameters of the participants.

Parameters	Pretest (wk0)	Min/Max
Metabolic outcomes		
FBS (mg/dl)	179.6±69.7	90/388
HbA_{1c} (%)	9.4±1.0	8.0/11.9
Total Cholesterol (mg/dl)	196.1±66.3	118/453
Triglyceride (mg/dl)	310.6±811.5	35/4568
HDL-C (mg/dl)	52.5±13.4	32/86
LDL-C (mg/dl)	116.7±40.3	40/222
Body compositions		
BW (kg)	72.5±14.4	48.7/104.9
BMI (kg/m^2)	27.7±5.2	19.4/38.9
Waist (cm)	93.2±12.5	78/120
• Male*	95.4±11.0	78/120
• Female**	91.7±13.5	78.5/119.5
TSF (mm)	28.7±8.3	11/47
MAC (cm)	32.3±4.4	24/43
Percent Body fat (%)	40.0±11.0	21.4/63.9
• Male	33.3±8.7	21.4/48.5
• Female	44.5±10.2	30.5/63.9
SBP (mmHg)	133.5±15.4	110/170
DBP (mmHg)	79.2±8.8	60/101

* n=12, **n=18

Table 4.5 Comparison between pretest and post-test score on participants' understanding of dietary self-management of diabetes.[1]

Parameter	Pretest	Post-test	95%CI of the Difference	P-value
Score	62.0±20.4	83.9±8.6	21.8(15,28.6)	<.001

[1] Values are means±SD.

*The mean difference is significant at the .05 level.

4.3 Changes of Problem-solving Score in Dietary Scenarios

Our results showed that dietary problem solving, as measured by the problem solving dietary scenarios tests (PSDS Test), was important for skill training relating to dietary self-management. Tables 4.6 suggested that more than half of the participants in each scenario could develop positive coping strategies on dietary specific problem situations while scenario 5 “Managing the stress related to food habit” clearly demonstrated that only 7 out of 30 participants could develop positive thinking, 13 out of 30 were standstill in excellent coping strategy level from the beginning to after intervention, and 10 participants could not develop into higher level. Therefore, no changes in this scenario were observed. The changes of actual number of participants within each score level in problem-solving scenario were summarized in the Table 4.6.

Table 4.6 shows changing in problem-solving score of dietary scenario 1, “Birthday or party”. At the beginning, before ongoing the intervention, there were 15 participants referred to “poor strategy group”, 9 participants in “moderately well strategy group”, 2 participants in “good strategy group”, and 4 participants in “excellent strategy group”. After 16-week intervention, 15 participants with “poor strategy group” moved forward to the “excellent strategy group” (8 participants), the “good strategy group” (2 participants), and 5 participants still in the “poor strategy group”. From 9 participants in “moderately well strategy group” at the beginning, there were 6 participants reaching the “excellent strategy group”, and 3 participants were still at the same point. Two participants in “good strategy group” at the beginning, were encouraged to the “excellent strategy group” (1 participant), and only one person still at this level. Lastly, four individuals who were in the “excellent strategy group” could keep their position after intervention.

In scenario 2, at the beginning of the intervention, there were 14 participants referred to “poor strategy group”, 10 participants in “moderately well strategy group”, 2 participants in “good strategy group”, and 4 participants in “excellent strategy group”. After 16-week intervention, 14 participants with “poor strategy group” moved forward to the “excellent strategy group” (7 participants), the “good strategy group” (2 participant), and 5 participants still in the “poor strategy group”. From 10

participants in "moderately well strategy group" at the beginning, there were 5 participants approaching the excellent strategy group, and 3 participants still at the same level, but decreasing in score point was observed in two persons, who scored from 1 to 0. All participants in good strategy group at the beginning were entirely encouraged to the excellent strategy group. Lastly, all of four individuals who were in the excellent strategy group were not changed after intervention.

Table4.6 Progress of dietary problem solving ability of participants after empowerment

Pretest score		**Post-test score**			
	N*	**0**	**1**	**2**	**3**
score 0 (poor strategy)					
Scenario 1: Birthday party or special occasion	15	5	0	2	8
Scenario 2: In your office or at home	14	5	0	2	7
Scenario 3: Receiving food from friends or relatives	12	1	0	0	11
Scenario 4: Eating out	14	3	1	0	10
Scenario 5: Stress management	15	8	1	2	4
score 1(moderately well strategy)					
Scenario 1: Birthday party or special occasion	9	0	3	0	6
Scenario 2: In your office or at home	10	2	3	0	5
Scenario 3: Receiving food from friends or relatives	6	0	3	1	2
Scenario 4: Eating out	6	0	3	0	3
Scenario 5: Stress management	0	0	0	0	0
score 2 (good strategy)					
Scenario 1: Birthday party or special occasion	2	0	0	1	1
Scenario 2: In your office or at home	2	0	0	0	2
Scenario 3: Receiving food from friends or relatives	9	0	0	4	5
Scenario 4: Eating out	7	0	0	1	6
Scenario 5: Stress management	0	0	0	0	0
score 3(excellent strategy)					
Scenario 1: Birthday party or special occasion	4	0	0	0	4
Scenario 2: In your office or at home	4	0	0	0	4
Scenario 3: Receiving food from friends or relatives	3	0	0	0	3
Scenario 4: Eating out	3	0	0	0	3
Scenario 5: Stress management	15	0	0	2	13

* N = the total number of participants before empowerment.

In scenario 2, at the beginning of the intervention, there were 14 participants referred to “poor strategy group”, 10 participants in “moderately well strategy group”, 2 participants in “good strategy group”, and 4 participants in “excellent strategy group”. After 16-week intervention, 14 participants with “poor strategy group” moved forward to the “excellent strategy group” (7 participants), the “good strategy group” (2 participant), and 5 participants still in the “poor strategy group”. From 10 participants in “moderately well strategy group” at the beginning, there were 5 participants approaching the excellent strategy group, and 3 participants still at the same level, but decreasing in score point was observed in two persons, who scored from 1 to 0. All participants in good strategy group at the beginning were entirely encouraged to the excellent strategy group. Lastly, all of four individuals who were in the excellent strategy group were not changed after intervention.

In problem-solving score of dietary scenario 3, “Receiving food from friends or relatives” reported that at the beginning of the intervention, there were 12 participants referred to “poor strategy group”, 6 participants in “moderately well strategy group”, 9 participants in “good strategy group”, and 3 participants in “excellent strategy group”. After 16-week intervention, 12 participants with poor coping strategy group moved forward to the excellent strategy group (11 participants), and only one participant was still in the poor strategy group. From 6 participants in “moderately well strategy group” at the beginning, there were 2 participants changed to the excellent strategy group, only one individual in the moderately well strategy group, and 3 participants were still at the same point. Nine individuals in good strategy group at the beginning were encouraged to the excellent strategy group (5 persons) and 4 persons were not improved. Lastly, all of three individuals who were in the excellent strategy group were not changed after intervention.

In problem-solving score of dietary scenario 4, “The eating out” demonstrated that before going into the intervention, there were 14 participants referred to “poor strategy group”, 6 participants in “moderately well strategy group”, 7 participants in “good strategy group”, and 3 participants in “excellent strategy group”. After 16-week intervention, 14 participants with “poor strategy group” 10 participants moved forward to the excellent strategy group, only one participant to the moderately well

strategy group, and 3 participants were still in the poor strategy group. From 6 participants in “moderately well strategy group” at the beginning, half of them moved forward to the excellent strategy group, and the rest of the participants were still in the moderately well strategy group. Seven individuals in good strategy group at the beginning were encouraged to the excellent strategy group (6 persons) and only a person was at the same point. Lastly, all of three individuals who were in the “excellent strategy group” stayed in the same level after intervention.

Finally, Table4.6 shows changing in problem-solving score of dietary scenario 5, “Managing the stress”. At the beginning of this study, there were half of the participants referred to “poor strategy group in diet related stress”, and the remainders were in the “excellent strategy group”. After 16-week intervention, half of all participants with poor strategy group moved forward to the excellent strategy group (4 participants), 2 participants into good strategy group, only a participant in the moderately well strategy group, and most of them (8 participants) were still in the poor strategy group. The rest of participants (15 participants) were in the “excellent strategy group” at the beginning, most of them (13 participants) were observed no differences of scores; the remaining 2 participants failed to remain in the category of “excellent strategy group” and moved down to the level of “good strategy group”. The examples of answers in different scenarios were categorized by the four levels of score and showed in Table 4.7 to 4.11.

Table 4.7 Examples of coping strategies among participants in scenario 1

Scenario 1: "A birthday party or a special occasion" Every year when there is a special occasion you know there will be foods that you like such as cake, ice cream, soft drinks in which will be hard to resist and you know you will gain weight after such occasion. For this year how would you deal with this situation?	
Scores	**Examples of coping strategies**
Score 0 "*poor strategies*"	"It's only happen once a year. I'd like to enjoy everything at the party" " My weight has been steady for quite sometime, so I think I'd like to enjoy everything at the party"
Score 1 "*moderately well strategies*"	"I refuse to host or go to any parties. I will inform my friends and family ahead of time that I need to loose weight this year, so they will not invite me to any parties." "I will enjoy myself at the party and will go exercise afterwards."
Score 2 "*good strategies*"	"I will try not to eat, but if someone insists then I will take one bite."
Score 3 "*excellent strategies*"	"I will eat less and I will enjoy conversations with others." "I will eat less and decrease the amount of food I eat in other meals." "I will do other things instead such as give merit to a monk so I don't have to think about food." "I will eat within my quotas. If today I have already reached my quotas then I will enjoy it another day."

Table 4.8 Examples of coping strategies among participants in scenario 2

Scenario 2: "At work or at home" Your coworker or friends or family members often buy sweets or snack foods that you like such as fruits, fried bananas, fried dough and chips. How would you deal with this situation?	
Scores	**Examples of coping strategies**
Score 0 "*poor strategies*"	"If I see something I like then I would eat everything but if I don't see it then I would not eat it."
Score 1 "*moderately well strategies*"	"I can't resist but I will eat everything much less than before." "I will eat now then I will exercise afterward."
Score 2 "*good strategies*"	"I will tell myself I am watching my weight but I can't really resist, so I will eat only 2 or 3 pieces."
Score 3 "*excellent strategies*"	"I will tell my friends "no" but if they insist then I will take a bite so they don't feel bad, if I can avoid it I will." "I usually don't eat snack when I am working." "I will eat less. I will tell myself that it is not delicious then will put it out of sight so I don't pick on it."

Table 4.9 Examples of coping strategies among participants in scenario 3

Scenario 3: "Receiving food from friends or family members" Family members and friends often buy food and snack foods as gifts for you such as sweets and gourmet foods. In the past you feel obligated to eat those foods because you do not want to hurt their feelings. How would you deal with this situation?	
Scores	**Examples of coping strategies**
Score 0 "*poor strategies*"	"I will eat everything but not everyday, so they won't feel hurtful." "I usually don't eat it but today I tell myself just a piece." "I will skip my diet today and will start again tomorrow."
Score 1 "*moderately well strategies*"	"I will eat everything but only half the amount." "I will enjoy the foods and will exercise afterward."
Score 2 "*good strategies*"	"I will eat a few things so friends and family don't feel hurtful. I will more conversations with them."
Score 3 "*excellent strategies*"	"I won't eat anything but I will give it to somebody else." "Explain that I am watching my weight and refuse the gift politely." "I will eat within my quotas. If today I have already reached my quotas then I will enjoy it another day."

Table 4.10 Examples of coping strategies among participants in scenario 4

Scenario 4: "Eating out" You eat out often. Usually you eat breakfast and lunch at work or near by restaurants which have rice dishes, noodles, fried fish balls, soft drinks, fruit drinks, and fruit stalls. How would you deal with this situation?	
Scores	**Examples of coping strategies**
Score 0 "*poor strategies*"	"Eat what I like and until I feel full so I have the energy to do my work." " Choose noodle dishes because they are low in calories and able to eat more without gaining weight"
Score 1 "*moderately well strategies*"	"Choose noodle dishes because they are quick and easy."
Score 2 "*good strategies*"	"Eat what I like but decrease the amount by half." "Choose what I want to eat but will exercise afterwards."
Score 3 "*excellent strategies*"	"Eat what I want but stay away from anything fried or oily such as spoon up meat and vegetable instead of lots of coconut milk." "Choose more soup dishes rather than curry with coconut milk; soup noodles rather than fried noodles; grilled pork balls rather than deep fried; water rather than soft drinks; or choose fruits rather than sweets. I need to keep reminding myself that I am watching my weight." "Choose one dish meal that I can choose the type of food and appropriate amount." "I will eat within my quotas. If today I have already reached my quotas then I will enjoy it another day."

Table 4.11 Examples of coping strategies among participants in scenario 5

Scenario 5: "Stress management" When you are much stressed, sad, or have anxiety either about work, business or family matters. How would you deal with this situation?	
Scores	**Examples of coping strategies**
Score 0 "*poor strategies*"	"Sometimes I can't get any food down but other times I can gorge down a lot of food." "I have no appetite and can't get any food down when I am stressed." "I eat to compensate for my feelings. Then I will get back on track tomorrow." "If I can't eat then I won't eat. Tomorrow I can compensate by eating more."
Score 1 "*moderately well strategies*"	"Go exercise first to build up my appetite. Then I can eat a lot." "I usually eat less but varieties in foods consumed."
Score 2 "*good strategies*"	"I know I should eat normally but either I eat or don't depends on my mood at the time." "I will eat normally, stress does not affect me but sometime I will eat less." "I will eat normally meals but I will modify foods to soft diet such as rice soup or cooked oatmeal."
Score 3 "*excellent strategies*"	"I will eat to ease my stress. However, I will choose the right foods that are appropriate or choose restaurants that have healthier choices." "For me, stress does not affect me. I will eat normally." "I will choose foods with my quotas as usual." "Go exercise first to build up my appetite. Then I will eat normally."

Table 4.12 Comparison of changed number of the participants achieving in difference levels of HbA_{1c} reduction in scenario 1 "Birthday party or any parties"*.

Parameters	N=30		Total
	Positive change group	Negative change group	
HbA_{1c} decreased<1%	1	2	3
HbA_{1c} decreased 1-1.9 %	8	9	17
HbA_{1c} decreased≥2%	8	2	10
Total	17	13	30

*Intention to treat analysis

Table 4.13 Comparison of changed number of the participants achieving in difference levels of HbA1c reduction categorized by characteristics of PSDS in scenario 2 "In your office or at home"*.

Parameters	N=30		Total
	Positive change group	Negative change group	
HbA_{1c} decreased<1%	1	2	3
HbA_{1c} decreased 1-1.9 %	8	9	17
HbA_{1c} decreased≥2%	7	3	10
Total	16	14	30

*Intention to treat analysis

Table 4.14 Comparison of changes in number of the participants achieving in difference levels of HbA1c reduction in scenario 3 "Receiving food from friends and relatives"*.

Parameters	**N=30**		**Total**
	Positive change group	**Negative change group**	
HbA_{1c} decreased<1%	1	2	3
HbA_{1c} decreased 1-1.9 %	9	8	17
HbA_{1c} decreased≥2%	9	1	10
Total	19	11	30

*Intention to treat analysis

Table 4.15 Comparison of changed number of the participants achieving in difference levels of HbA1c reduction categorized by characteristics of PSDS in scenario 4 "The eating out"*.

Parameters	**N=30**		**Total**
	Positive change group	**Negative change group**	
HbA_{1c} decreased<1%	1	2	3
HbA_{1c} decreased 1-1.9 %	11	6	17
HbA_{1c} decreased≥2%	1	2	10
Total	20	10	30

*Intention to treat analysis

Table 4.16 Comparison of changed number of the participants achieving in difference levels of HbA1c reduction categorized by characteristics of PSDS in scenario 5 "The stress management"*.

Parameters	N=30		Total
	Positive change group	Negative change group	
HbA_{1c} decreased<1%	0	3	3
HbA_{1c} decreased 1-1.9 %	3	14	17
HbA_{1c} decreased≥2%	4	6	10
Total	7	23	30

*Intention to treat analysis

Table 4.17 Comparison of changed number of the participants achieving in difference levels of HbA1c reduction categorized by characteristics of PSDS in scenario 1 "Birthday party or any parties"**.

Parameters	N=22		Total
	Positive change group	Negative change group	
HbA_{1c} decreased<1%	1	1	2
HbA_{1c} decreased 1-1.9 %	8	3	11
HbA_{1c} decreased≥2%	8	1	9
Total	17	5	22

** Per protocol analysis

Table 4.18 Comparison of changed number of the participants achieving in difference levels of HbA1c reduction categorized by characteristics of PSDS in scenario 2 "In your office or at home"**.

Parameters	**N=22**		**Total**
	Positive change group	**Negative change group**	
HbA_{1c} decreased<1%	1	1	2
HbA_{1c} decreased 1-1.9 %	8	3	11
HbA_{1c} decreased≥2%	7	2	9
Total	16	14	22

** Per protocol analysis

Table 4.19 Comparison of changed number of the participants achieving in difference levels of HbA1c reduction categorized by characteristics of PSDS in scenario 3 "Receiving food from friends and relatives"**.

Parameters	**N=22**		**Total**
	Positive change group	**Negative change group**	
HbA_{1c} decreased<1%	1	1	2
HbA_{1c} decreased 1-1.9 %	9	2	11
HbA_{1c} decreased≥2%	9	0	9
Total	19	3	22

** Per protocol analysis

Table 4.20 Comparison of changed number of the participants achieving in difference levels of HbA1c reduction categorized by characteristics of PSDS in scenario 4 "The eating out"**.

Parameters	N=22		Total
	Positive change group	Negative change group	
HbA_{1c} decreased<1%	1	1	2
HbA_{1c} decreased 1-1.9 %	11	0	11
HbA_{1c} decreased≥2%	8	1	9
Total	20	2	22

** Per protocol analysis

Table 4.21 Comparison of changed number of the participants achieving in difference levels of HbA1c reduction categorized by characteristics of PSDS in scenario 5 "The stress management"**.

Parameters	N=22		Total
	Positive change group	Negative change group	
HbA_{1c} decreased<1%	0	2	2
HbA_{1c} decreased 1-1.9 %	3	8	11
HbA_{1c} decreased≥2%	4	5	9
Total	7	15	22

** Per protocol analysis

Table 4.22 Comparison of changed number of the participants achieving in difference levels of BMI categorized by characteristics of PSDS in scenario 1 "Birthday party or any parties"**.

BMI (kg/m^2)[a]	N=22		Total
	Positive change group	Negative change group	
18.5-22.9	6	2	8
23.0-24.9	1	1	2
25.0-29.9	8	1	9
≥30	2	1	3
Total	17	5	22

** Per protocol analysis,

[a] WHO: Asia-Pacific perspective 2000.

Table 4.23 Comparison of changed number of the participants achieving in difference levels of BMI categorized by characteristics of PSDS in scenario 2 "In your office or at home" **.

BMI (kg/m^2)[a]	N=22		Total
	Positive change group	Negative change group	
18.5-22.9	6	2	8
23.0-24.9	2	0	2
25.0-29.9	6	3	9
≥30	2	1	3
Total	16	5	22

** Per protocol analysis

[a] WHO: Asia-Pacific perspective 2000.

Table 4.24 Comparison of changed number of the participants achieving in difference levels of BMI categorized by characteristics of PSDS in scenario 3 "Receiving food from friends and relatives"**.

BMI (kg/m^2)[a]	N=22		Total
	Positive change group	Negative change group	
18.5-22.9	7	1	8
23.0-24.9	1	1	2
25.0-29.9	9	0	9
≥30	2	1	3
Total	17	5	22

** Per protocol analysis

[a] WHO: Asia-Pacific perspective 2000.

Table 4.25 Comparison of changed number of the participants achieving in difference levels of BMI categorized by characteristics of PSDS in scenario 4 "The eating out" **

BMI (kg/m^2)[a]	N=22		Total
	Positive change group	Negative change group	
18.5-22.9	6	2	8
23.0-24.9	2	0	2
25.0-29.9	9	0	9
≥30	3	0	3
Total	17	5	22

** Per protocol analysis

[a] WHO: Asia-Pacific perspective 2000.

Table 4.26 Comparison of changed number of the participants achieving in difference levels of BMI in scenario 5 "The stress management"**.

BMI (kg/m^2)[a]	N=22		Total
	Positive change group	Negative change group	
18.5-22.9	2	6	8
23.0-24.9	0	2	2
25.0-29.9	4	5	9
≥30	1	2	3
Total	17	5	22

** Per protocol analysis,

[a] WHO: Asia-Pacific perspective 2000.

4.4 Changes in Goal Achievement

In this study, a personal goal card was used as a measurement tool. After 16-week individualized empowerment approach in dietary self-management education, 87.2% of participants' own goals were achieved (Table 4.27) and 24 out of 30 participants (80%) were met the target goal achievement (Table 4.28). Examples of the action plan of participants were demonstrated in Figure 4.5 to 4.12.

Table 4.27 Mean±SD of the duration (days) and the percentage of participants achieving their goals at different periods after intervention.

Goal achievement	mean±SD (n=30)	
	Number of day achieved	% of goal achieved
Period 1[a] (14 days)	11.9±2.2	85.2±15.4
Period 2[b] (14 days)	12.1±1.5	86.3±11.0
Period 3[c] (28 days)	24.8±2.7	85.0±11.0
Period 4[d] (28 days)	25.3±2.7	87.2±11.1
Period 5[e] (28 days)	25.1±2.4	87.2±10.0

[a] Period 1 = week 2, [b] Period 2 = week 4, [c] Period3 = week 8 [d] Period 4 = week 12, [e] Period 5 = week 16.

Table 4.28 Target goal achievement of the participants at the end of the study

% of goal achieved	Participants who met goals
≥ 80%	24/30 (80%)
< 80%	6/30 (20%)

Reduced rice intake
"I will reduce my CHO intake. I will decrease rice consumption by half with asking the server to spoon up only half of what he/she normally does, starting at the next meal."
"I will decrease rice consumption by half with spooning up the appropriate amount of rice myself instead of allowing the server to do it. I will begin at the next meal."
Reduced fruits intake
"I will decrease the amount of fruits to no more than 2 servings per day by measuring the amount of fruits eaten on the small fruit plate each time. I will begin at the next meal."
"I will decrease the amount of fruits by tracking goal completed each day."
"I will decrease the amount of fruits by sharing with coworkers or family members and eating only the appropriate amount of what I am allowed. I will decrease the frequency of consumption by keeping it out of sight. I will begin tomorrow."
Reduced sweet/desserts and late night snacks
"I will decrease the late night snacks by dividing snack onto small plate and put the rest out of sight. I will begin this night."
"I will choose one serving of healthy fat milk or fruit or a small plate (pouch) of healthy nut as late night snack by purchasing in advance. I will start the day after tomorrow."
"I will tell my wife to use sweetener in the cooking process of sweets instead of sugar and eat after meals. I will begin the day after tomorrow."
Reduced sweetened drinks
"I will decrease the amount of sweetened drinks in half by choosing smaller size bottle, or sharing a small bottle with another family member. I will begin these activities on the next time."
"I will be more assertive and refuse to buy the yogurt drink when the salesperson comes to sell at my office. I will begin at the next time she comes."
"I will use sweetener with my coffee instead of sugar in the morning. I will start tomorrow morning."

Figure 4.1 Examples of participants' action plan with reduced CHO as the goal

Reduced dietary fat intake
"I will eat broil or grill lean meats, chicken and fish, boil eggs and not fried them. If I would like to eat some fry or sauté menus, I will use one or two servings of oil depending on my quotas and use non-stick pan. I will begin tomorrow."
"When eating out, I will order food that is boiled, broiled, grilled, steamed, lean, or skinless. If those are not available, I will eat only one fry or sauté menu at that day. I will begin these activities on the next day."
Reduced desserts and snack foods
"I will eat no more than 2 servings of fruits instead of dessert at the time. I will start the next day."
"I will eat two small sizes of wheat dough enclosing with minced pork and steamed (Sa-la-poa, Chinese style) instead of fried doughs (Pa-tong-go,Chinese style) for my breakfast. I will start tomorrow morning."

Figure 4.2 Examples of participants' action plan with reduced dietary fat as a goal.

Increased dietary protein
"I will buy lean meat and have them portioned into 3 oz then will pack in individual plastic bags to keep in my freezer, so I will have them ready when I cook. I will buy and prepare in advance and will begin this action on the next weekend."
"I will choose a soup noodle without the noodle with extra fish balls or pork balls portioned into 3 oz and double vegetables every other lunch meals."
"I will visualize the amount of lean meat equivalent to the size of my own palm starting at the next meal."
"I will use a plate model as a guide tool to plan at least two meals, 1/4 of the plate with lean meat. I will start at the next meal."

Figure 4.3 Examples of participants' action plan with increased dietary protein

Increased vegetable intake
"I will double my usual serving of vegetables, but without cooking oil. I will use the plate model as a measurement guide tool to plan at least two meals, 1/2 of plate with vegetables."

Figure 4.4 Examples of participants' action plan with increased vegetables intake

Personalized action plan

1. I will reduce my rice intake

   In order to reach the goal above, I will do the following activities:

   - Decrease rice consumption by half.
   - Use plate model as a guide tool, 1/4 plate is rice.

   I will begin these activities in the next meal (07/11/2005).

Barriers that get in my way	***How I will overcome these barriers***
• I eat a lot of rice at the time.	1) Ask the server to spoon up only half of what he/she normally does when eating out. 2) Spoon up the appropriate amount of rice myself instead of allowing the server to do it. 3) Use plate model as a guide, not over 1/4 plate.
• I love to eat hot curries.	1) Eat less in hot curries by half. 2) Eat vegetable soup instead.

Figure 4.5 Example of a participant's action plan process with reduced CHO intake

Personalized action plan

1) I will reduce my saturated fats intake.

   In order to reach the goal above, I will do the following activities:

   - Eat broil or grill lean meats, chicken and fish, boil eggs and not fried them.
   - Eat fruits instead of bakery.
   - Use fats and oils in quotas.

   I will begin these activities in the next meal (07/09/2005).

Barriers that get in my way	***How I will overcome these barriers***
• I eat out a lot.	1) When eating out, order food that is baked, grilled, boiled, steamed, lean, or skinless. 2) When eating out, choose no more than two menus of sauté or fried foods. 3) When seminar in a hotel, choose fruit instead of bakery or desserts by eating by no more than a fruit plate and do not go around a bakery or dessert stall.

Figure 4.6 Example of a participant's action plan process with reduced fat intake

Personalized action plan

1) I will increase my intake of dietary protein.

In order to reach the goal above, I will do the following activities:

- Buy lean meat and have them portioned into 3 oz then will pack in individual plastic bags to keep in my freezer.
- Buy and prepare in advance.
- Eat a soup noodle with extra fish balls or pork balls at lunch.
- Snack on grilled fish balls or pork balls.
- Use a plate model as a guide tool to plan at least two meals, 1/4 of the plate is lean meat portions.

I will begin these activities in the next meal (18/11/2005).

Barriers that get in my way	***How I will overcome these barriers***
• I normally eat less amount of protein.	1) When eating out, order a soup noodle with extra fish balls or pork balls. 2) Eat grilled fish balls or pork balls as a snack no less than 2 matched-boxes size. 3) Spoon up lean meat in 1/4 of plate model at least two meals daily.

Figure 4.7 Example of a participant's action plan process with increased dietary protein intake.

Personalized action plan

1) I will increase my intake of dietary fibers.

In order to reach the goal above, I will do the following activities:

- Double my usual serving of vegetables, but without cooking oil.
- Use the plate model as a measurement guide tool to plan at least two meals, 1/2 of plate with vegetables.

I will begin these activities in the next meal (18/11/2005).

Barriers that get in my way	***How I will overcome these barriers***
• I normally eat fewer either amount or type of green leafy vegetables.	1) Buy and prepare non-greened vegetables such as white; Chinese cabbage, baby corns, and soybean sprout. 2) When eating out, order foods with extra non-greened vegetables instead. 3) When eating out, order a soup noodle with extra vegetables at a time. 4) Spoon up vegetable in 1/2 of plate model at least two meals daily.

Figure 4.8 Example of a participant's action plan process with increased vegetable intake.

4.5 Changes in Nutrient Intake

4.5.1 Previous Nutrient Intake─Food Habit

For background characteristics of dietary intake, the mean of total energy intake calculated from 3-day food records was 1765±474 kcal/day; for male and female were 1825±457 and 1725±475 kcal/day, respectively (Table 4.32). The mean caloric distribution showed intake from carbohydrate to be 48.6%, from protein 15.6%, and from total fat 35%. Typically, the serving of intake of rice, noodle and bread food group for the study participants was 7.2 (IQR=6.7) servings/day. Desserts included sugars; confectionery; snacks and sugar added-beverages intake were 3.1 (IQR=5.1) servings/day. Fruit intakes were 2.3 (IQR=4.0) servings/day; vegetable intakes were 1.6 (IQR=2.2) servings/day whereas milk and milk products were 0.7 (IQR=0.9) serving/day, mostly from low-fat milk. Protein intake was 9.4 (IQR=3.2) servings/day, mostly from medium fat meat (2.2 servings/day); very lean meat and high fat meat intake were equal at 1.0 serving/day. Moreover, fat and oil intake was 8.6 (IQR=4.7) servings/day; coming from saturated fatty acid (SFA) (6.0 servings/day), and polyunsaturated fatty acids PUFA (1.9 servings/day). In addition, the monounsaturated fatty acids (MUFA) intake was relatively low derived mainly from boiled peanut. An example of SFA intake was typically from palm oil (3.0 servings per day) and animal oil (0.7 serving per day), indicating the participants ate food away from home often. In addition, the main source of PUFA intake was from soybean oil (1.2 serving per day). The examples of foods mostly consumed in different food groups were shown in table 4.29 to 4.31.

Table 4.29 Examples of foods mostly consumed in carbohydrate food groups at baseline.

Sugar-added beverages

- Regular soft drinks
- Iced tea and iced coffee
- 3-in-1 coffee
- Ready to drink green tea with fructose added

Desserts and snacks

- Deep-fried dough, Chinese style (Patong-go)
- Deep-fried bananas
- Hagoa, Kanomjeep, Salapoa (steamed wheat dough enclosing minced meat, or as known as dimsum)
- Croissant , puff, and pie

Fruits and fruit juice

- Guavas, apples, green mangos
- Pomelos
- Pineapples
- Water melon
- Yellow mangos, papayas
- Orange juice

Starch

- Rice, noodle, and white bread

Table 4.30 Examples of foods mostly consumed in meat food groups at baseline.

High fat meat

- Ground pork
- Breakfast sausage
- Chinese pork sausage
- Pork spareribs
- Organ meat
- Processed pork

Medium-fat meat

- Fried poultry with skin, and fried fish
- Egg
- All styles of tofu
- Spareribs prime cuts trimmed off fat

Lean meat

- Fat trimmed pork and beef
- Poultry without skin
- Poultry drumstick
- Ham

Very lean meat

- Fish, tuna canned in saline
- Seafood
- Fish balls and meatballs
- Texture vegetable protein

Table 4.31 Examples of foods with fat content mostly consumed at baseline.

Foods with higher content of saturated fat

- Palm oil and animal oil

Foods with higher content of monounsaturated fat

- Boiled peanut

Foods with higher content of polyunsaturated fat

- Soybean oil

4.5.2 Changes in Nutrient Intake

For dietary intake**,** the result of this study showed that energy decreased significantly by 432 (95%CI=251, 613) kcal/day in which the mean of energy intake for male participants was 1503±309 kcal/day and female was 1219±415 kcal/day (Table 4.32). The mean reduction in total carbohydrate intake was 163±54 gm/day, but percent distribution of carbohydrate (48.9%) showed nearly the same as the beginning of the study. The amount of starch foods group (*P* .003), dessert and snack (*P* .001), sugar-added beverages (*P* .010), and fruit intake (*P* .001), were significantly declined (Table 4.33). In addition, a significant reduction in high glycemic-index food intake was reported in this study, and medium-glycemic food intake also significantly decreased (Table 4.34). No significant differences in low glycemic-index food intake were observed between before and after intervention. The examples of glycemic-index foods were reported in Table4.35. Energy from fat and saturated fatty acids (SFA) intake decreased significantly (*P* < .001) (Table 4.36). The average servings from monounsaturated fatty acids (MUFA) also increased significantly (*P* .001). However, the increase in MUFA food choices such as olive oil and boiled peanuts, were not significant (Table 4.37). Method of cooking demonstrated in Table 4.38 reported that the process of cooking with a lot of oil, including sautéing/ deep frying/ and intake of coconut curry, was significantly declined (*P* < .001); whereas cooking without oil was significantly increased (*P* .006). After 16-week intervention, intake of protein increased from 15.6% to 22.2% of total energy, which exceeded 1.3 gm protein per kilogram ideal body weight (Table 4.39). Meat, poultry, fish and dairy products tended to be a major source of protein, most of them from very lean meat (2.7 servings/day), lean meat (2.0 servings/day), and significantly low intake in high-fat meat (*P* .006) (Table 4.40). The intake of skim milk also increased significantly (*P* .002), so was low fat milk (Table 4.41). Leafy Vegetable intake increased from 1.6 (IQR=2.2) to 2.8 (IQR=4.4) servings per day. Alcohol intake also significantly decreased (*P*.012). The main choices of dietary changes are summarized in the Table4.33.

Table4.32 Change of energy and macronutrient intake after intervention[1].

Nutrient Composition	Pre-Post			
	0 wk (n=30)	16 wk (n=30)	95%CI for difference(0,16wk)	*P-value*
Energy (Kcal)	1764±474	1332±396	-432 (251,612)	<.001
• **Male**	1825±457	1503±309	-322 (33.9,610)	.032
• **Female**	1724±495	1219±414	-505 (255,755)	.001
Carbohydrate (g)	216±66.3	163±54.1	-52.8(28.8,76.7)	<.001
Protein (g)	68.0±22.4	73.3±20.0	5.3(-5.1, 15.6)	.306
Fat (g)	68.5±23.0	42.3±19.7	26.1(16.0,36.2)	<.001
% caloric distribution				
%CHO	48.6±6.4	48.9±8.8	0.2(-3.1, 3.5)	.897
%PROT	15.6±3.1	22.2±4.0	-6.6(-8.5,-4.8)	<.001
%FAT	35.0±7.2	27.9±7.7	7.1(3.4,10.8)	.001

[1] Values are means±SD.

* The mean difference is significant at the .05 level.

Table 4.33 The amount (servings) of different food groups consumed before and after intervention[1].

Serving sizes	Food Group	Servings per day		
		wk0	wk16	*P*-value
1 slice bread,..	Rice, noodle, bread.	7.2(6.7)	4.8(3.6)	.003
1 c raw leafy vegetable,..	Vegetables	1.6(2.2) †	2.8(4.4) †	.027
1 medium fruit,..	Fruits	2.3(4.0) †	1.1(1.3) †	<.001
8 oz. milk,..	Milk, dairy product	0.7(0.9) †	0.8(1.2) †	.271
3 oz. cooked meat, poultry,..	Meats, poultry, fish	5.7(2.7)	6.7(3.1)	.289
½ c cooked dry beans,..	Nuts, seeds, dry beans	0.2(0.8) †	0.4(1.7) †	.217
1 tsp. oil,..	Fats and oils	8.6(6.7) †	5.3(7.0) †	.012
8 oz. soda,..	Sweets	3.1(5.1) †	0.9(2.7) †	<.001
	Sugar sweet	2.1(3.6) †	0.4(1.1) †	<.001
	Sugar beverage	0.3(3.1) †	0.0(1.2) †	.010
12 oz. beer, 4 oz. wine,..	Alcohol	0.0(0.2)†	0.0(0.0)†	.012
1 tsp fish sauce	Sodium	6.4±1.9[a]	4.7±1.2[a]	<.001

[1] Values are medians [IQR (inter-quartile range, reported fixed range between 75th percentile and 25th percentile)]. [a] Mean±SD. *The mean difference is significant at the .05 level.

† Using Wilcoxon Signed Ranks Test for abnormal distribution.

Table 4.34 Selection of carbohydrate foods categorized by GI value[1].

Choice of rice, bread, noodle group	Serving per day		
	wk0	wk16	P-value
Low GI food (GI value < 55)	1.3(0.9)†	0.7(0.9) †	.375
Medium GI food (GI value 56-69)	0.4(1.4)	0.2(0.6)	.026
High GI food (GI value > 70)	5.1(5.0)	2.7(2.6)	.002

[1] Values are medians [IQR (inter-quartile range, reported fixed range between 75th percentile and 25th percentile)]. * The mean difference is significant at the .05 level.

† Using Wilcoxon Signed Ranks Test for abnormal distribution.

Table 4.35 Examples of glycemic-index foods after intervention.

High glycemic-index foods	Medium glycemic-index foods	Low glycemic-index foods
Cooked white rice	Rice noodles	Boiled mungbean noodles
Streamed glutinous rice	Brown rice	Rice bean seed
Potatoes	Whole wheat bread	Oatmeal
Pumpkin		Corn
Wheat noodles		Fermented rice noodles
White bread		

Table 4.36 Consumption pattern of fat and oil before and after intervention[1].

Type of fat and oil	Servings per day		
	wk0	wk16	P-value
SFA Group	6.0(3.8)	1.0(1.7)	<.001
MUFA Group	0.0(0.03) †	0.0(2.0) †	.001
PUFA Group	1.9(3.04) †	1.4(2.0) †	.178

[1] Values are medians [IQR (inter-quartile range, reported fixed range between 75th percentile and 25th percentile)]. ***** The mean difference is significant at the .05 level.

† Using Wilcoxon Signed Ranks Test for abnormal distribution.

Table 4.37 Types of fat and oil consumption before and after intervention[1].

Choices of fat and oil	servings per day			
	1 Serving size	**wk0**	**wk16**	***P*-value**
Foods with high saturated fat				
Palm Oil	1 tsp	3.0(3.4)	0.7(2.0)	<.001
Lard/animal oil	1 tsp	0.7(2.2)†	0.0(0.0) †	<.001
Coconut milk	1 tbp	0.0(1.0) †	0.0(0.0) †	.002
Butter	1 tsp	0.0(0.7) †	0.0(0.0) †	.034
Foods with high monounsaturated fat				
Olive oil	1 tsp	0.0(0.0) †	0.0(0.6) †	.342
Peanut	10 nuts	0.1(0.3) †	0.1(0.6) †	.227
Almond/ cashew nut	6 nuts	0.0(0.1) †	0.0(0.1) †	.798
Sesame seeds	1 tbp	0.0(.02) †	0.0(0.0) †	.678
Foods with high polyunsaturated fat				
Soybean	1 tsp	1.2(2.5)	0.8(1.7)	.386

[1] Values are medians [IQR (inter-quartile range, reported fixed range between 75th percentile and 25th percentile)]. ***** The mean difference is significant at the .05 level.
† Using Wilcoxon Signed Ranks Test for abnormal distribution.

Table 4.38 Median (IQR)[1] of the number of daily food consumption (menu/day) before and after intervention categorized by method of cooking with and without oil.

Method of cooking	wk0	wk16	P-value
Method of Cooking with oil	2.8(2.8)	1.3(1.1)	<001
Sautéing	1.2(1.7)	0.8(0.7)	.018
Deep Frying	1.0(1.1)	0.3(0.7)	<.001
Coconut curry	0.3(0.7) †	0.0(0.0) †	.001†
Method of Cooking without oil	5.7(2.8)	7.5(3.0)	.006
Boiling	1.3(1.1)	2.7(1.7)	<.001
Grilling	0.3(0.7) †	0.3(1.0) †	.473 †
Blanching	0.3(1.0) †	0.3(1.0) †	.652 †
Raw	1.7(2.0)	1.3(2.1)	.593
Steaming	2.0(0.8)	2.0(1.7)	.226

[1] Values are medians [IQR (inter-quartile range, reported fixed range between 75th percentile and 25th percentile)] and reported by menus per day.

***** The mean difference is significant at the .05 level.

† Using Wilcoxon Signed Ranks Test for abnormal distribution.

Table 4.39 Mean±SD of daily protein intake of the participants before and after intervention.

Parameter	Pre-Post			
	Week0	Week16	95%CI of the Difference	*P*-value
Protein (gm)	68±22.4	73.3±20	5.3(-5.1,15.6)	.306
Protein (gm/IBW)	1.3±0.6	1.3±0.3	0.05(-0.1,0.2)	.577

Table 4.40 Consumption pattern of meat consumed before and after intervention[1].

Meat Group	**serving/day**		
	Wk0	**Wk16**	***P-value***
Meat protein	5.7(2.7)	6.7(3.1)	.289
Very lean meat	1.0(1.8)	2.7(3.7)	.046
Lean meat	0.6(1.5) †	2.0(1.9) †	.001
Medium meat	2.2(2.3)	1.5(2.1)	.183
High fat meat	1.0(1.5) †	0.0(0.4) †	.006

[1] Values are medians [IQR (inter-quartile range, reported fixed range between 75th percentile and 25th percentile)] and reported by servings per day.

***** The mean difference is significant at the .05 level.

† Using Wilcoxon Signed Ranks Test for abnormal distribution.

Table 4.41 Consumption pattern of milk selection before and after intervention[1].

Parameter	**Serving per day**		
	Week0	**Week16**	**P-value**
Skim milk	0(0)	0(1)	.002
Low-fat milk	0(2)	0(3.3)	.244
Whole milk	0(0)	0(0)	.720

[1] Values are medians [IQR (inter-quartile range, reported fixed range between 75th percentile and 25th percentile)] and reported by serving per day.

***** The mean difference is significant at the .05 level.

4.6 Changes in Body Composition and Metabolic Outcome

4.6.1 Changes in Body Composition

In comparison to pre-test and post-test in the study group, the results showed a relatively significant reduction in all of the body composition variables included body weight, BMI, waist circumference (WC), triceps skinfold (TSF), mid-arm circumference (MAC), % body fat, and blood pressure (Table4.42).

Table 4.42. Mean±SD of the anthropometric parameter of the participants before and after intervention

Parameters	**Pre-Post**			
	0 wk (N=30)	**16 wk (N=30)**	**95%CI for difference(0,16wk)**	***P-value***
BW (kg)	72.5±14.4	70.7±13.8	-1.8(1.0,2.6)	<.001
BMI (kg/m^2)	27.7±5.2	27.0±5.1	-0.6(0.4,0.9)	<.001
WC (cm)	93.2±12.5	90.8±11.6	-2.3(0.6,4.1)	.011
• Male[a]	95.4±11.0	93.7±9.6	-1.7(-4.1,0.6)	.135
• Female[b]	91.7±13.5	89.0±12.7	-2.7(0.1,5.4)	.045
TSF (mm)	28.7±8.3	25.5±7.8	-3.2(1.4,5.0)	.001
MAC (cm)	32.3±4.4	31.8±4.4	-0.5(0.0,0.9)	.034
% Body fat	40.0±11.0	33.3±7.7	-6.7(3.9,9.5)	<.001
• Male	33.3±8.7	29.5±6.2	-3.8(0.4,7.2)	.032
• Female	44.5±10.2	35.9±7.7	-8.6(4.6,12.7)	<.001
SBP (mmHg)	133±15.4	125±10.8	-8.0(2.4,13.5)	.007
DBP (mmHg)	79.2±8.8	76.1±7.0	-3.1(0.3,5.9)	.033

***** The mean difference is significant at the .05 level. [a] n=12, [b] n=18

After our intervention participants who classified as normal BMI were increased from 20% to 30%, at risk group was decreased from 13.3% to 6.7%, and obesity 2 group, was decreased from 26.7% to 20% respectively (Table 4.43).

Table 4.43 Changes in the number and percentage of participants in different BMI levels before and after intervention

BMI (kg/m^2) [*]	**N=30**		**% of the participants**	
	Week0	**Week16**	**Week0**	**Week16**
18.5-22.9	6	9	20	30
23.0-24.9	4	2	13.3	6.7
25.0-29.9	12	13	40	43.3
≥ 30	8	6	26.7	20

[*] Classified by WHO: The Asia-Pacific Perspective 2000.

Our findings indicated that seven out of twelve participants in men and fourteen out of eighteen participants in women have had abdominal obesity (Table 4.44), after intervention the reduction in waist circumference was seen in only 1 out of 30 cases achieved the target (< 90cm in men).

Table 4.44 Changes in the participants' number and percentage of large waist circumference before and after intervention.

week	Waist Circumference (WC) *	
	Male (n=12)	Female (n=18)
	> 90 cm	> 80 cm
Week 0	8 (66.7%)	14 (77.8%)
Week 16	7 (58.3%)	14 (77.8%)

* WHO: The Asia-Pacific Perspective 2000

Table 4.45 demonstrated that 20 out of 30 participants had higher blood pressure than the American Diabetes Association (ADA) recommendation, 2006 at the beginning of this study and slight declined in the number of participants with abnormal blood pressure after intervention.

Table 4.45 The number and percentage of abnormal blood pressure of the participants before and after intervention.

Week	**SBP mmHg***	**DBP mmHg****
	≥ 130	**≥ 80**
Week0	20 (66.7%)	6 (20%)
Week16	13 (43.3%)	2 (6.7%)

*, ** ADA Recommendation 2006

4.6.2 Changes in Biochemical Indicators

After 16-week of empowerment program, participants had a significant reduction in glycemic control. With this approach, HbA_{1c} and FBG concentration decreased by 1.7 (95%CI: 1.2, 2.2) %, and 32.1(95%CI: 3.6, 60.6) mg/dl respectively

(Table 4.46). In addition, percents of participants who met HbA_{1c} achievements were divided into 3 groups as shown in Table 4.47. The first group decreased by 2% was found in 33.3% of participants, and the next decreased by 1% to 1.9% in 56.7%, whereas the last group decreased less than 1% in 10% of the participants. For lipid profile, cholesterol decreased by 23.1 (95%CI: 2.5, 43.6) mg/dl.

Table 4.46 Mean±SD of the biochemical parameters of the participants before and after intervention

Biochemical Parameters	**Pre-Post**			
	0 wk (N=30)	**16 wk (N=30)**	**95%CI for difference(0,16wk)**	***P-value***
FBS (mg/dl)	179±69.7	147±48.4	-32.1(3.6,60.6)	.029
HbA_{1c} (%)	9.4±1.0	7.7±1.0	-1.7(1.2,2.2)	<.001
Total Cholesterol (mg/dl)	196±66.3	173±44.3	-23.1(2.5,43.6)	.029
Triglyceride (mg/dl)	310±811	144±102	-166 (,-455,123)	.249
HDL-C (mg/dl)	52.5±13.4	51.3±11.2	-1.2(-5.1,2.7)	.524
LDL-C (mg/dl)	116±40.3	111±35.2	-5.4(-18.3,7.6)	.403

***** The mean difference is significant at the .05 level

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Table 4.47. Number and percentage of the participants achieving different levels of HbA_{1c} reduction after intervention

Parameters	**Number of the participants[1]**	**% of the participants**
HbA1c decreased < 1%	3	10
HbA1c decreased 1-1.9%	17	56.7
HbA1c decreased ≥ 2%	10	33.3

[1] N=30

4.7 Additional Results

4.7.1 Changes in body weight at 3-month after Finishing the Research Protocol

Our findings demonstrated that at three months after finishing our research project, 17 out of 30 (56.7%) participants could significantly maintain weight loss, while 8 participants (27%) continued to lose more weight (Table 4.48).

Table 4.48 Mean±SD of the changes of body weight at baseline, after intervention, and 3-month after completion of the research protocol[1].

Parameter	Mean±SD (N=30)			95%CI of the difference	*P* value
	Week0	Week16	Week28		
BW	72.5±14.4	70.7±13.8	71.1±14.0	-1.8 (0.7,2.8)*[a]	<.001
				-1.5 (0.4, 2.5)*[b]	.004
				0.4 (-0.3, 0.9)[c]	.614

[1] Values were analyzed by ANOVA with repeated measures.

*Significant difference both within and among groups. The mean difference is significant at the .05 level. Adjusted for multiple comparisons was by Bonferroni.

[a, b, c] Values with these superscripts are the mean and 95% confidence interval for the difference between baseline and after intervention (week16), baseline and 3-month after completion of the research protocol (week28) as well as among week16 and 28 respectively.

4.7.2 Changes in HbA_{1c} Level at 3-month after Finishing the Research Protocol

Three months after finishing research study, we intended to observe the changes of HbA_{1c} level which monitored the long-term glycemic outcome of the empowerment approach. The results reported that 15 out of 30 participants (50%) remained the same results, while 11 participants (36.7%) were increased; only 4 participants (13.3%) continued to improve (Table 4.49). When comparing the percentages of participants achieving different levels of HbA_{1c} reduction between

after intervention and 3-month after completion of research protocol, noteworthy elevations were seen in the group which HbA_{1c} level decreased less than 1% point in 33.3%. In contrast, slight reductions were observed in both groups in which HbA1c level decreased by 1% to 1.9% points and decreased by 2% points in 36.7% and 30% of participants respectively but only one participant could not achieve HbA1c level in the group which HbA1c level decreased by 2% points (Table 4.50). In addition, the mean average of HbA_{1c} at baseline was 9.4±1.0 percentage point. The mean differences of HbA_{1c} values were significant reduction, at baseline and after intervention as well as baseline and 3-month after the completion of the research by 1.7% points (95%CI: 1.0, 2.3) and 1.5% points (95%CI: 0.9, 2.2) respectively. Whereas after 16-week intervention, the mean HbA_{1c} was 7.7±1.0 percentage points and 3-month after the completion of the research (week28) was 7.9±1.0 percentage points but there were not significantly difference among these groups (Table 4.51).

Table 4.49 Changes of HbA_{1c} level at 3-month after completion the research protocol (week28).

Changes of HbA1c Level	N=30	% of the participants
Increased	11	36.7
No change	15	50
Decreased	4	13.3

Table 4.50 Changes in number and percentage of the participants achieving different levels of HbA_{1c} reduction after intervention and 3-month after the completion of the research protocol (week28)

Parameters	N=30	
	Week 16	Week 28
HbA1c decreased < 1%	3 (10%)	10 (33.3%)
HbA1c decreased 1-1.9%	17 (56.7%)	11 (36.7%)
HbA1c decreased ≥ 2%	10 (33.3%)	9 (30%)

Table 4.51 Mean±SD of the changes of HbA1c level at baseline, after intervention, and 3-month after completion of the research protocol [1]

Parameters	Mean±SD (N=30)			95%Confidence Interval for the difference	*P*-value
	Week 0	Week 16	Week 28		
HbA1c	9.4±1.0	7.7±1.0	7.9±1.0	-1.7(1.0,2.3)*[a]	<0.001
				-1.5(0.9,2.2)*[b]	<0.001
				-0.2(-0.3,0.04)[c]	0.146

[1] Values were analyzed by ANOVA with repeated measures.

*Significant difference both within and among groups. The mean difference is significant at the .05 level. Adjusted for multiple comparisons was by Bonferroni.

[a, b, c] Values with these superscripts are the mean and 95% confidence interval for the difference between baseline and after intervention (week16), baseline and 3-month after completion of the research protocol (week28) as well as among week16 and 28 respectively.

4.7.3 Classification of characteristics of the participants by coping strategy in dietary problem situations

Our results in PSDS Test and dietary education and counseling session showed that we could classify the characteristics of the participants from 4 levels of point score through coping strategies for dietary specific situation as following.

First of all was a "0" scoring which implied "*poor strategy*". It indicated undeveloped thinking in dietary self-management to make changes. It was assigned if nothing was done to improve the problem situations. Participants who were placed in this score usually have difficulty identifying their problems which prevented them from keeping their diabetes in good control. Moreover, they did not recognize how to cope with these problems and barriers, and could not handle their feelings either about problems in their life or dietary self-management. They were also lack of the right dietary knowledge for self-management and not attempting to change.

The second level was scored "1" which indicated "*moderately well strategy*". It represented developing of the thinking process towards making dietary changes by themselves. It was assigned if a small amount of strategy was done to improve the problem situations. At this score point, participants could identify their problems and barriers. Moreover, they intended primarily to raise awareness of the benefits of changing and diet options and they recognized that a diet change was possible with no ambivalence. A trial-and-error approach either in type of food choices, the amount of food eaten, timing of meals, the effect of food on glucose or special situation and problem solving, was observed, which derived from accumulating dietary information and led to taking action. A negative problem-solving decision was observed, which characterized by a tendency to view problems as threats, pessimistic about the ability to solve problems, and intolerance with the procedure to solving problems. Evaluations and guidance for the appropriate food choices needed to be monitored closely.

The third level was scored "2" which indicated "*good strategy*". It represented developed precise thinking in dietary self-management to make changes; ready to make a change; but not being consistent in taking action and having low self-efficacy. It was assigned if strategies included trying out different ways of overcoming barriers to dietary goals, coping moderately well with dietary related stress, asking for support for dietary management when needed, and sometimes supporting themselves in dealing with dietary problem situations. Participants could identify their problems and barriers, generate alternatives, select proper alternatives, implement and finally evaluate the alternatives. Participants recognized the important role in changing diet options and made decisions in the appropriate food choices, not only in type but also in the amount. However, the ability to follow a diet action plan for the participants in this group was not consistent due to lack of social support from family, friends or health care professional, lack of motivation, and needed additional information. A positive problem-solving orientation was a infrequently pragmatic approach and characterized by the ability to view the problems as a challenge, feel optimistic that problems were solvable, and ability to tolerate the disappointment occurred during

solving problems. Continued evaluations and guidance for appropriate food choices were needed.

The last level was scored "3" which indicated "*excellent strategy*". It represented developed precise thinking in dietary self-management to make changes; ready to make a change; and was consistent in taking actions in the right way with high self-efficacy. It was assigned if strategies included trying out different ways of overcoming barriers to dietary goals, planning ahead and flexibility in carrying out these strategies, coping well with dietary related stress, asking for support for dietary management when needed, or mostly supporting themselves in dealing with dietary problem situations. Participants at this score point believed that they knew what part(s) they were ready to change and what part(s) they were not. They could choose realistic dietary goals, come up with ideas to help them reach their goals, and were able to turn their goals into workable plan. Moreover, they though and tried out of different ways to overcome barriers to their dietary goals. They could handle feelings about dietary self-management and recognize the positive ways to cope with diet related stress. A positive problem-solving orientation was a pragmatic approach and characterized by the ability to view the problem as a challenge, feel optimistic that problems were solvable, view themselves as self-efficacious in solving problems, understood that problem-solving taken times and effort, and committed themselves to active problem solving. Participants recognized the important role in changing diet options and made decision to continue appropriate food choices either in type or the amount in difference situations. Occasional guidance might be needed.

CHAPTER V
DISCUSSIONS

This research study focuses on the empowerment approach concept in dietary self-management education by providing education and counseling technique to the participants with type 2 diabetes at Theptarin General Hospital. The duration of the main study was one year starting from November 2004 to November 2005. Follow-up research was also conducted for HbA1c monitoring, adding up to a study time of 3-month after finishing the main project. There were many topics found and the build-up knowledge could be discussed.

5.1 Demographic Characteristics

This study used a self-selected sample of people with diabetes, whose demographic characteristics constrain its generalizability. The majority of participants were middle-aged, women, and overweight. They were well educated, having greater or equal to bachelor's degree as well as having small businesses which generated relatively high income, and very few participants receiving money from their children or relatives. Half of them had had diabetes for over or equal to 10 years and more than half were using oral hypoglycemic agents. All of them had been provided diabetes and dietary education but more than half had dietary education not more than a year. Therefore, almost all of the participants having moderately well understanding of dietary self-management were enrolled into this study. Moreover, Theptarin offer a regular diabetes course for clients on diabetes and self-care by diabetes educators, followed by a session on exercise and also an ultimate behavior modification activity, the Theptarin Diabetes Camp. Here, participants not only acquire classroom knowledge, but also put that knowledge into practice through creative and well-

planned activities. A study of participants' glycosylated hemoglobin levels showed that they achieved better glucose control after attending the camp. However, the effect has not been permanent, indicating behavior modification activities need to be reinforced.

In the usual practice, a goal was set by healthcare professionals, not by the client. Occasionally, some healthcare professionals were frustrated by their clients because of no adherence as it was to them. The empowerment approach, a new way to provide education and counseling, which the researcher used in this program, was a change from the previous practice. However, the services and other environment were used the same patterns.

5.2 Empowerment-based approach and problem-solving learning in dietary self-management education leading to behavior changes, improved metabolic indices as well as body composition.

Our outcomes tend to support the effectiveness of the empowerment based approach demonstrated by increasing of the participants' understanding in dietary self-management scores and also problem solving scores in dietary specific situations (PSDS score). This was similar to the study of Suwannaruk (103) determining the application of empowerment based approach program in diabetes self-care of type 2 diabetes which reported that the experimental group had significantly more knowledge, understanding, self-efficacy, and practice after intervention than before participating in the program; and also more than the comparison group ($P<.001$). Limpaphanont (104) studying in the effectiveness of health promotion program on behavior changes of diabetic patient by applying self-efficacy theory, interpersonal relationship and individualized problem solving process in this program, reported the increasing positive health knowledge and practice in self-care related to food control after the experiment ($P<.001$), with the experimental group receiving individualized health promotion program for 8 weeks. In our study, we found that after intervention participants who understood dietary self-management demonstrated improvement in

glycemic control than before the empowerment intervention. With understanding in dietary self-management, we thought that it derived from receiving specific knowledge responded to their concerns and priorities under the research content areas (Appendix2). Furthermore, we thought that providing the right knowledge and easy messages conveying to the participants were basically important for their own decision making in problem solving leading to the success of the empowerment-based approach. Komindr (105) reported that the right and simple dietary education for diabetic patients led to the willingness and enthusiasm in diet control and created responsibility for changes in metabolic outcome. Qualitative studies had described successful decision makers as those who had a sound knowledge base about the diabetes regimen and who, from accumulated experience in managing problems with diabetes, were able to adapt their regimen from the initial knowledge base (106-108). By accumulating past knowledge and experiences with current specific knowledge led to learning in problem solving process. Similar to the same study of Limpaphanont (104), good diabetes knowledge including dietary knowledge led to better dietary self-care and positive behavior changes after individualized approach focusing on participants' self problem solving and goal settings which agreed with the studies of Brown SA (109,110,111). In addition, Glasgow (112) suggested that this could be strengthened by adding behavioral components. On the contrary, Chomyong (113) found that diabetes education could improve only knowledge but not the practice. The study of Tantayotai (114) showed no relationship between diabetic knowledge and diabetic control in adults' uncontrolled type 2 diabetes after diabetes education with systematic approach. She found that most participants encountered problems in diet control more than other problems.

With any positive changes in the participants, we thought that interpersonal relationship between client and researcher was a key role of success for building a trust and development of learning skill. Moreover, by our observation, we found that building rapport with the patients, having a sense of warmth and caring as well as the use of tone of voice and body language to convey the messages which were all important aspects to help the participants feel at case and open to talk to us. Several studies (104, 115) supported these ideas.

In the process of empowerment based approach, we used step by step of this approach to help the participants identify their own problems. Open-ended questions were used to help the participants identifying their problems especially reflecting on problem behaviors. Participants were much more likely to be motivated to address their own concerns, priorities, and behaviors rather than by the researcher, similar to the study of Funnell et al (116). By observation, all of the participants could identify their own problems but they said they did not manage. This was supported by the study of Loachote (113), which determined self-care behaviors in type 2 diabetes, found that most of the participants recognized both positive and negative effects to their practices but they did not manage as a result of lacking in training skill for problem solving. One of the strategies used to assist the participants to solve problems in the study of Funnell et al (88, 116) was to identify costs or barriers and benefits of common concerns and problems. However, this study classified only barriers on their concerns and problems. More point scores of the understanding in dietary self-management were displayed by their well-managed in problem solving dietary scenarios (PSDS Test).

Our results in PSDS Test showed that we could classify the characteristics of the participants from 4 levels of point score through coping strategies for dietary specific situation.

Regarding to stress management scenario, we suggested that it should be concerned by healthcare professional because stress is one of the major risk factors to coronary heart disease (CHD) (ADA 2006). Living with and managing diabetes raises multiple psychosocial and emotional issues (116). These were supported by the study of Polonsky et al (33) which assessed psychosocial distress in diabetes and developed the diabetes distress scale measuring distress related to emotional burden. Glasgow et al (117) suggested that depressed affect or distress was one of the factors potentially influencing levels of diabetes problem solving skills (dietary and exercise), self-management, and clinical outcomes. Furthermore, the study of Funnell et al (116) demonstrated that feelings often affected patients' self-management decisions. Accordingly, emotional stress during the dietary practice should be emphasized and

an intervention process specific to food habit such as individual counseling; group support; peer to peer support group should be initiated. The dietitian should be able to detect and refer the patient to other healthcare professionals for treatment of stress. A large study by Glasgow et al (117) in multiracial analyses revealed that problem solving was a core aspect of effective diabetes and chronic self-management strategies. In addition, Supavadee (104) supported that problem-based approach including knowledge provided by patients' concerns, initiated learning from problem-solving process and built up the attempt to promote self-care behavior.

In our study, we could mainly classify our participants according to the ability to cope with specific dietary situations in two characteristics. The first characteristic was positive change group and the second was negative change group which also included no change. There were similar results of the participants who were in positive change group between the two statistical method, intention to treat (16 out of 30), and per protocol analysis (16 out of 22) (Appendix3). HbA1c values tended to improve greater than 1% point in most of the participants although there was no correlation with PSDS score. It might be affected by small samples size. Furthermore, our findings demonstrated that 12 out of 14 participants who got a score of "0" point at the beginning of the study succeeded in HbA1c reduction while 2 of them had HbA1c elevations. One participant who had had drug failure (oral glycemic agent) from the beginning of the program developed HbA1c elevation after the program. This might be due to pancreatic failure since most of his FPG were elevated in spite of good dietary record. In addition, there were no significant differences in problem-solving score between difference sexes, education levels, or BMI levels in our findings (Appendix4). These data were supported by the study of Glasgow and Associates. It might be affected by the willingness of the participants to accomplish in problems solving dietary situations.

The purposes of the enrolled-participants in this study mainly derived from the motivation for the desire to lose weight, to keep blood glucose under good control, to avoid oral hypoglycemic agents (OHA) or insulin injection and for additional purpose as free of any charging. Goal setting is noted as a strategy for dietary and physical

activity behavior changes (101,118,119). Our findings showed the relatively high percentage of goal achievements to be 87.2% (Table 4.10). The goals set by our participants mostly derived from the attempt to decrease carbohydrate food content by carbohydrate counting and plate methods. These data were supported by the study of Brekke et al (120) and Christina et al (32), where they examined changes in health and lifestyle indicators over 6 months in 244 patients with type 2 diabetes receiving nutrition counseling. With the internal motivation and concerns including their dietary knowledge led to learning of their own experiments by trial and error in the real-life situations. At the beginning of the study, the participants were asked about the success they achieved. But in between the empowerment approach intervention, we learned the process whereby our participants solved their problems. Therefore, after this finding, we focused on their experiments more than on success or failure in their own goal setting. This data was supported by the study of Funnell et al (116). There were several ways to reach a goal. Our findings demonstrated that goal achievement derived from continuing small changes in dietary self –management, the participants knew along the way what part(s) of dietary self-management that they were ready or not ready to change. It might have many alternatives but they knew which of their dietary goals was most important and easy for them to manage first. In our finding, the empowerment-based approach intervention helped the participants to come up with good ideas to help them reach their own goals by themselves. With these findings, it is clear that one important role of the dietitian or related healthcare professionals are to help participants discover and use their own innate ability to gain mastery over their dietary self-management. Christina et al found in their study that positive outcomes were observed and clinical improvement were greatest between baseline and 3-month, with stabilization between 3-month to 6-month. At 3 months few participants had met clinical goals and found the plateau in clinical progress between 3 months and 6 months but in our study the improvement of goal achievements tended to continue from the first period (week 2) to the last period after intervention (week 16) (Table 4.10). Moreover, some continue to improve even 3 months after finishing the study.

In this study, from the success of participants' goal setting led to change in food habit both the quality and the amount of food consumption. Our results indicated that the healthier eating pattern identified in this study characterized by moderate carbohydrate, low fat intake, choosing healthier meat (increasing very lean meat and lean meat consumption, limiting in high fat meat intake) as well as choosing healthy cooking methods by consuming foods cooked low-fat way rather than the higher fat counterpart such as frying (Table 4.14,4.15,4.20,4.22). The decline of total carbohydrate (CHO) food consumption in different carbohydrate food groups was shown in our study (Table4.15), although the percentage of energy from carbohydrate indicated no significant different after intervention, supporting the fact that the decline in the total amount of CHO within the right proportion was important. The American Diabetes association (ADA) Recommendation, 2007 indicated that monitoring carbohydrate, whether by carbohydrate counting, exchanges, or experience-based estimation, remain a key strategy in achieving glycemic control (ADA, 2007) (35). In our practice, most of the topics discussed with the participants in the education and counseling sessions were carbohydrate counting, exchanges, plate model, and food labeling. However, the percentage of energy from carbohydrate met the Joslin Diabetes Guideline for Prevention Diabetes and Obesity, moderate carbohydrate consumption (total carbohydrate approximately 160 gm/day) were displayed in our participants after intervention. With these topics, we discussed quotas and encouraged them to think about how many portions they should consume and make a decision on how to achieve it.

Furthermore, our study indicated that the energy from fat and saturated fat (SFA) intake were lower (Table4.18), supported by the fact that there was a decrease in the consumption of foods containing fat and oil and also increase in foods cooked without oil i.e. boiling instead of sautéing, frying, and deep frying (Table4.20). The proportionate increase of foods containing monounsaturated fat (MUFA) in our study was due to the decrease in fatty foods as well as the decrease in the amount of oil consumed in cooking. Our experience supported Christina et al (32) that individualized nutrition counseling program improved choosing healthy cooking, modified healthy recipes, lower foods containing fat both in amount and type.

Moreover, our finding indicated that protein intake tended to increase which exceeded 1.3 gm protein per kilogram ideal body weight which was slightly high for participants with diabetes. However, all of them had normal kidney function before and after the study. In addition, a moderate carbohydrate intake and lean sources of protein replacing some high carbohydrate foods were displayed. Comparison between our findings and the study of Maki et al which compared the effect of a reduced-glycemic-load (RGL) diet for 36 weeks with the traditional low-fat diet in overweight and obese adults supported that no evidence was present of any adverse effects of the RGL diet on CVD risk factors. Therefore, the result of lowering the dietary glycemic load (moderate carbohydrate) and increasing protein intake in RGL diet is a reasonable alternative for weight management by significant reduction not only body weight but also fat mass at week 12 but not at week 36 . Although such diets may produce short-term weight loss and improve glycemia in overweight and obese adults without diabetes, we recommended that patients with diabetes should be closely follow-up in their kidney function. Their creatinine (Cr) tests 3-month after completion our intervention, demonstrated that 16 out of 23 from medical chart reviews reported no changes, and only one of them tended to slightly decreased while 6 out of 23 tended to increase slightly (Appendix 5).

It was rewarding to note that, after individualized empowerment based approach in dietary self-management, the participants lost weight, exhibited reduction in percent body fat, waist circumference, tricep skinfold thickness, mid-arm circumference, systolic and diastolic blood pressure, and improvement in glycemic control as well as total cholesterol. After our intervention participants who classified as normal BMI were increased, at risk group, and obesity group were decreased respectively (Table 5.7).

In addition, the risk for cardiovascular disease (CVD) is especially high when abdominal obesity is present (waist circumference > 90cm in men or 80cm in women). Abdominal obesity and its related risk factors are now recognized as part of metabolic syndrome (ADA, 2004). Our findings indicated that seven out of twelve participants in men and fourteen out of eighteen participants in women have had abdominal

obesity (Table 4.24, 4.26), after intervention the reduction in waist circumference was seen in only 1 out of 30 cases achieved the target (< 90cm in men). Therefore, we suggested that the role of dietitians or related healthcare professionals should consider abdominal obesity as a therapeutic target needed to be proposed in the education and counseling sessions in the clinical practice setting.

Hypertension is also a major risk factor for CVD and microvascular complications such as retinopathy and nephropathy. In type 2 diabetes, hypertension may be present as part of metabolic syndrome (i.e. obesity, hyperglycemia, and dyslipidemia), which is accompanied by high rates of CVD. ADA Recommendation 2006 for patients with diabetes indicated that systolic blood pressure (SBP) and diastolic blood pressure (DBP) should be lower than 130/80 mmHg. In our study, 20 out of 30 participants had higher BP than the recommendation and slight improvement in the number of participants with abnormal blood pressure (Table 5.9). The implications include a slight reduction in sodium intake though increased consumption of vegetables, and non-fat or low-fat dairy products; avoiding excessive alcohol consumption (Table 4.15). Therefore, another therapeutic target must be guided by dietitian during the goal setting is reduction of abnormal blood pressure.

Consequently, self-management behaviors were likewise improved, paralleling and likely influencing positive clinical outcomes including weight loss of 1.8 kg achieved over 16 weeks in this study (Table4.24). Sustained weight loss seen in lifestyle intervention groups of the Finnish Diabetes Prevention Study (17) and the Diabetes Prevention Program (121) by Intensive intervention resulted in weight losses of 4.2 kg over a year, 3.5 kg over 2 years, and 2 kg over 5 years, respectively. Our findings demonstrated that at three months after finishing our research project, 17 out of 30 (56.7%) participants could significantly maintain weight loss, while 8 participants (27%) continued to lose more weight. Therefore, our findings demonstrated that the empowerment-based approach showed a strong positive effect in sustaining weight loss (Table 5.10).

Three months after finishing research study, we intended to observe the changes of HbA_{1c} level which monitored the long-term glycemic outcome of the empowerment approach. The results reported that 15 out of 30 participants (50%) remained the same results, while 11 participants (36.7%) were increased; only 4 participants (13.3%) continued to improve (Table 4.27). When comparing the percentages of participants achieving different levels of HbA_{1c} reduction between after intervention and 3-month after completion of research protocol, noteworthy elevations were seen in the group which HbA_{1c} level decreased less than 1% point in 33.3%. In contrast, slight reductions were observed in both groups in which HbA1c level decreased by 1% to 1.9% points and decreased by 2% points in 36.7% and 30% of participants respectively but only one participant could not achieve HbA1c level in the group which HbA1c level decreased by 2% points (Table 4.28). In addition, the mean average of HbA_{1c} at baseline was 9.4±1.0 percentage point. The mean differences of HbA_{1c} values were significant reduction, at baseline and after intervention as well as baseline and 3-month after the completion of the research by 1.7% points (95%CI: 1.0, 2.3) and 1.5% points (95%CI: 0.9, 2.2) respectively. Whereas after 16-week intervention, the mean HbA_{1c} was 7.7±1.0 percentage points and 3-month after the completion of the research (week28) was 7.9±1.0 percentage points but there were not significantly difference among these groups (Table 4.29).

Our outcomes projected a dramatic change in glycemic control supports a part of success in the empowerment-based approach program. Franz et al (27) and the large study of UK Prospective Diabetes Study 7 (UKPDS) (25) indicated that randomized nutrition therapy outcome studied in persons with type 2 diabetes had documented 3-month reduction in HbA1c values of 2 percentage points in newly diagnosed participants and 1 percentage point in those who have had diabetes for an average of 4 years. The study of Lemon et al (32) also found a 1.4 percentage points reduction in HbA1c values over 3 months in which 54% of their participants had been newly diagnosed within the past year. In our study, the reduction of HbA_{1c} of 2 percentage points was set for our target of success. We found that 10 out of 30 participants (33.3%) achieved this goal while 56.7% of our participants had been diabetes for over 10 years. In addition, at 3-month after the completion of our

empowerment program, only one participant could not maintain his HbA1c value at 2 percentage points. Furthermore, with 1.7% points of the mean reduction of HbA1c values after intervention found that at 3-month after the completion of our program, reported that 15 out of 30 participants (50%) maintained the same results, while 4 participants (13.3%) continued to improve. Therefore, our findings demonstrated that the empowerment-based approach in individualized dietary self-management showed a strong positive effect in sustaining good glycemic control. Moreover, UKPDS indicated a 1% decrease in HbA1c value was associated with a 37% reduction in the risk of microvascular complications of diabetes. The 1.7 percentage point 16-week HbA1c value decline in our study, if sustained, could represent a substantial decrease in health care costs associated with microvascular complications. Although our findings demonstrated sustainable positive glycemic outcome, we found the limitation from our study design. The one group participant without a comparison group could not clearly demonstrate that the desirable outcome derived from our empowerment-based approach which we provided. Therefore, in our study could not clearly demonstrate the effectiveness of this program. Further research is needed to have group comparison with the conventional approach or other approaches which focus on adherence to dietary self-care behaviors. Focus-group interviews may be included to the intervention to focus in-depth in dietary problem solving, and coping strategies in both success and failure groups. A practical limitation to the broader use of this program is that almost all of the participants were directed toward those who had received basic diabetes education so that there was some common understanding of diabetes and diet control.

Our experience confirms the importance of creating focused, well designed studies to ensure enjoyment, participants independent on dietary coping strategies with no pressure from any diet regimens, and willingness to participate in future outcome research.

With an informal small group discussion or telephone informal interview conducted after the intervention, participants indicated how much they felt they learned under no pressure, how meaningful the program had been for them, and the

positive changes outcomes were the starting point, encouraged them to continue. This program was based on trusting the wisdom of the participants. This trust was affirmed and deepened. The summary of step-by-step approach in empowerment dietary self-management process showed in Appendix .

In our opinion, to achieve overall better health outcome by empowerment-based approach, dietitians and healthcare professionals should also continue to foster other important risk factors after patient has accomplished the glycemic control.

CHAPTER VI
CONCLUSION

The objective of this study was to determine the effectiveness of the individualized empowerment approach in dietary self-management education to improve metabolic control in patients with type 2 diabetes by testing in problem solving ability in dietary specific situations, the changes in dietary self-care behavior, and the changes in metabolic control resulted from this approach. The majority of participants were middle-aged, women, and overweight. They were well educated, generated relatively high income; half of them had had diabetes for over or equal to 10 years, and more than half were using oral hypoglycemic agents. All of them had been provided diabetes and dietary education previously; but more than half had dietary education not more than a year.

Our results demonstrated that the problem solving dietary scenario *(PSDS)* appears to produce meaningful scores. After empowerment-based approach, the *PSDS scores* tended to get higher positive changes which demonstrated participants' optimistic problem solving ability in dietary specific situations. Although there were no relationship between *PSDS score* and HbA_{1c} values, achievement of 1.5% point absolute reduction of HbA_{1c} values at 3 months after completion the empowerment-based approach displayed a significant success. In addition, by using of positive dietary coping strategies in these volunteers led them to understand dietary self-management, and resulted in achieving their specific dietary goals (87.2%). Accordingly, 80% of the participants achieved their own goals at the end of the study.

Our finding demonstrated that the success of participants' goal setting led to changes in their food habit both the quality and the amount of food consumption. The

healthier eating pattern identified in this study characterized by moderate carbohydrate (48%), low fat intake (28%), choosing the right type of meat consumed as well as healthy cooking method by increasing very lean meat and lean meat consumption, and consuming foods prepared low-fat method more than higher fat way. The decline of total carbohydrate (CHO) food consumption in different carbohydrate food groups remained a key strategy in achieving glycemic control, supporting the fact that the decline in the total amount of CHO within the right proportion is important. With the positive dietary behavior outcomes led to significantly decline in body composition especially in body weight; waist circumferences; and % body fat as well as the glycemic control. In our opinion, to achieve overall better health outcome by empowerment-based approach, dietitians and healthcare professionals should also continue to foster other important risk factors after patient has accomplished the glycemic control.

The strength of the study was a significantly decline in HbA_{1c} value after the intervention which did not significantly decline at 3-month after completion the program. This resulted from the positive influence of the empowerment-based approach. This program was based on trusting the wisdom of participants and building a no-pressure circumstance where participants learned to understand their problems and ways to cope with them with dietitians being the facilitator.

In conclusion, the individualized empowerment-based approach in dietary self-management program offers benefits to both participants and dietitians. Participants receive a valuable and potentially critical supplement to basic dietary self-management training. Dietitians benefit from observing how their efforts help participants discover the power from insight to improve their own lives. We also gained inspiration and support from the participants to provide and improve dietary self-management education continuously.

REFERENCES

1. Division of International Health, Bureau of Health Policy and Planning, Office of the Permanent Secretary, ministry of Public Health: Thailand Health Profile 1997-1998: Bangkok, Printing Press, Express Transportation Organization, 2000
2. Cheepudomwit S, Chapman N, Neal B, Suriyawongpaisal P, Whelton P, and Woodward M, for the InterAsia Collaborative Group: Cardiovascular risk factor level in urban and rural Thailand: results from the International Collaborative Study of Cardiovascular Disease in Asia (InterAsia). Eur J Cardiovasc Prev Rehab. In press
3. Wichai Aekplakorn, Ronald P. Stolk, Bruce Neal, Paibul Suriyawongpaisal; et al. The Prevalence and Management of Diabetes in Thai Adults. Diabetes Care 2003; 26:2758-2763.
4. Funnell MM, Anderson RM. Patient Empowerment: A Look Back, A Look Ahead. Diabetes Educator 2003; 29: 454-464.
5. Anderson RM, Funnell MM, Butler PM, et al. Patient Empowerment: Results of a randomized controlled trial. Diabetes Care 1995; 18: 943-949.
6. Rena Wing, Bonnie Gillis. Lifestyle Balance: The Diabetes Prevention Program's Lifestyle change Program, Participant Notebook, University of Pittsburgh: National Institute of Diabetes and Digestive and Kidney Diseases, National Institute of health; 1996: 1-114.
7. Rubin RR, Napora JP. Behavior Change. In; Franz MJ, Kulkami K, Polonsky WH, Yarborough PC, Zamudio V,eds. Diabetes Education and Program Management. A Core Curriculum for Diabetes Education 5th Ed, Chicago: American Association of Diabetes Educators; 2003:65-88.

8. Henk A. van Dam, Frans van der Horst, Bart van den Borne, et al: Provider-patient interaction in diabetes care: effects on patient self-care and outcomes. A systematic review: Patient Education and Counseling 2003: 51, 17-28.

9. Sarah Wind et al. Global Prevalence of Diabetes: Estimates for the year 2000 and projections for 2030. Diabetes Care 2004; 27: 1047-1053.

10. Haslam DW, James WP. Obesity. Lancet 2005; 366:1197-1209.

11. Parvez Hossain, Bisher Kawar, Meguid El Nahas. Obesity and diabetes in the developing world ─ A growing challenge. New England Journal of Medicine Jan 2007; 356:213-215.

12. Aekplakorn W, Stolk RP, Neal B, Suriyawongpaisal P, Chongsuvivawong V, Cheepudomwit S, Woodward M, InterASIA Collaborative Group: The prevalence and management of diabetes in Thai adults: the International Collaborative Study of Cardiovascular Disease in Asia. Diabetes Care 2003; 26:2758–2763.

13. Bureau of Health Policy and Planning, Ministry of Public Health: Burden of Disease and Injuries in Thailand: Priority Setting for Policy. Bangkok, the Printing House of the War Veterans Organization of Thailand under the Royal Patronage of His Majesty the King, 2002.

14. Haffner SM, Lehto S, Ronnemaa T, Pyorala K, Laakso M: Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction. N Engl J Med 1998; 339:229–234.

15. Woodward M, Zhang X, Barzi F, Pan W, Ueshima H, Rodgers A, MacMahon S: The effects of diabetes on the risks of major cardiovascular diseases and death in the Asia-Pacific region: Asia Pacific Cohort Studies Collaboration. Diabetes Care 2003; 26:360–366.

16. Pan XR, Li GW, Hu YH, Wang JX, Yang WY, An ZX, Lin J, Xiao JZ, Cao HB, Liu PA, Jiang YY, Wang JP, Zheng H, Zhang H, Bennett PH, Howard BV: Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance: the Da Qing IGT and Diabetes Study. Diabetes Care 1997; 20:537–544.

17. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, Keinanen-Kiukaanniemi S, Laakso M, Louheranta A, Rastas M, Salminen V, Uusitupa M, the Finnish Diabetes Prevention Study Group: Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med 2001; 344:1343–1350.

18. Diabetes Prevention Program Research Group: Reduction in the incidence of type 2 diabetes with life style intervention or metformin. N Engl J Med 2002; 346:393–403.

19. Marion J. Franz. A core curriculum for diabetes education: Medical nutrition therapy for diabetes. Fifth edition. American Association of Diabetes Educators (AADE) 2003; 3-55.

20. American Diabetes Association. Evidenced based nutrition principles and recommendations for the treatment and prevention of diabetes and related complications (position statement). Diabetes Care 2003; 26 (supplement 1): S51-S61.

21. Franz MJ, Bantle JP, Beebe CA, et al. Evidence-based nutrition principles and recommendations for the treatment and prevention of diabetes and related complications (technical review). Diabetes Care 2002; 25:148-198.

22. Pastors JG, Warshaw H, Daly A, et al. The evidence for the effectiveness of medical nutrition therapy in diabetes management. Diabetes Care 2002; 25:608-613.

23. Pastors JG, Franz MJ, Warshaw H, Daly A, Arnold MS. How effective is medical nutrition therapy in diabetes care? J Am Diet Assoc 2004; 103: 827-31.

24. Delahanty LM,Halford BN. The role of diet behaviors in achieving improved glycemic control in intensively treated patients in the Diabetes control and Complication Trial. Diabetes care 1993; 16:1453-1458.

25. UK Prospective Diabetes Study (UKPDS) Group: UK Prospective Diabetes Study 7: response of fasting plasma glucose to diet therapy in newly presenting Type 2 diabetics patients. Metabolism 1990; 39:905-912.

26. Kulkarni K, Castle G, Gregory R, et al. Nutrition practice guideline for type 1 diabetes mellitus positively affects dietitian practices and patient outcomes. J Am Diet Assoc 1998; 98:62-70.

27. Franz MJ, Monk A, Barry B, et al. Effectiveness of medical nutrition therapy provided by dietitians in the management of non-insulin-dependent diabetes mellitus: a randomized, controlled clinical trial. J Am Diet Assoc 1995; 95:1009-1017.

28. Johnson EQ, Valera S. Medical nutrition therapy in non-insulin-dependent diabetes mellitus improves clinical outcome. J Am Diet Assoc 1995; 95:700-701.

29. Franz MJ, Pastors JG, Warshaw H, Daly AE. Does “diet” fail? Clinical Diabetes 2000; 18:162-168.

30. Goldhaber-Fiebert JD, Goldhaber-Fiebert SN, Tristan ML, Nathan DM. Randomized controlled community-based nutrition and exercise intervention improves glycemia and cardiovascular risk factors in type 2 diabetic patients in rural Costa Rica. Diabetes Care 2003; 26:24-29.

31. Ziemer DC, Berkowitz KJ, Panayioto RM, El-Kebbi IM, Musey VC, Anderson LA, et al. A simple meal plan emphasizing healthy food choices is as effective as an exchange-based meal plan for urban African Americans with type 2 diabetes. Diabetes Care 2003; 26:1719-24.

32. Lemon CC, Lacey K, Lohse B,Hubacher DO, Klawitter B, Palta M. Outcomes monitoring of health, behavior, and quality of life after nutrition intervention in adults with type 2 diabetes. J Am Diet Assoc 2004; 104:1805-15.

33. Polonsky WH, earles J, Smith S, Pease DJ, Macmillan M, Christensen R, et al. Integrating medical management with diabetes self-management training. A randomized controlled trial of the Diabetes Outpatient Intensive Treatment program. Diabetes Care 2003; 26:3048-53.

34. Banister NA, Jastrow ST, Hodges V, Loop R, Gillham MB. Diabetes self - management training in a community clinic improves patient outcomes at modest cost. J Am Diet Assoc 2004; 104:807-10.

35. American Diabetes Association: Nutrition Recommendation and Interventions for Diabetes (Position Statement). Diabetes Care 2007(Suppl.1); 30:S48-61.

36. UK Prospective Diabetes Study (UKPDS) Group. Intensive blood-glucose control with slphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet. 1998; 352:837-853.

37. National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults: Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (ATP III). JAMA 2001; 285: 2486-2497.

38. American Diabetes Association: Standard of medical care in diabetes (Position Statement). Diabetes Care 2007; 30:S9-11.

39. WHO Expert Consultation: Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet 2004; 363:157–163.

40. World Health Organization: The Asia-Pacific Perspective Redefining Obesity and Its Treatment. February 2000.

41. Alberti KG, Zimmet P, and Shaw J: The metabolic syndrome: a new worldwide definition. Lancet 2005; 366:1059–1062.

42. Aekplakorn W, Kosulwat V. Obesity indices and cardiovascular risk factors in Thai adults. Int J Obesity (Lond) 2006 Dec; 30(12): 1782-1790.

43. Klein S, Sheard NF, Pi-Sunyer X, Daly A, Wylie-Rosett J, Kulkarni K, Clark NG: Weight management through lifestyle modification for the prevention and management of type 2 diabetes: rationale and strategies: a statement of the American Diabetes Association, the North American Association for the Study of Obesity, and the American Society for Clinical Nutrition. Diabetes Care 2004; 27:2067–2073.

44. Norris SL, Zhang X, Avenell A, Gregg E, Schmid CH, Kim C, Lau J: Efficacy of pharmacotherapy for weight loss in adults with type 2 diabetes mellitus: a meta-analysis. Arch Intern Med 2004; 164:1395–1404.

45. Wolf AM, Conaway MR, Crowther JQ, Hazen KY, Nadler L, Oneida B, Bovbjerg VE: Translating lifestyle intervention to practice in obese patients with type 2 diabetes: Improving Control with Activity and Nutrition (ICAN) study. Diabetes Care 2004; 27:1570–1576.

46. Manning RM, Jung RT, Leese GP, Newton RW: The comparison of four weight reduction strategies aimed at overweight patients with diabetes mellitus: four-year follow-up. Diabet Med 1998; 15:497–502.

47. Ryan DH, Espeland MA, Foster GD, Haffner SM, Hubbard VS, Johnson KC, Kahn SE, Knowler WC, Yanovski SZ: Look AHEAD (Action for Health in Diabetes): design and methods for a clinical trial of weight loss for the prevention of cardiovascular disease in type 2 diabetes. Control Clin Trials 2003; 24:610–628.

48. Mayer-Davis EJ, D'Antonio AM, Smith SM, Kirkner G, Levin MS, Parra Medina D, Schultz R: Pounds off with empowerment (POWER): a clinical trial of weight management strategies for black and white adults with diabetes who live in medically underserved rural communities. Am J Public Health 2004; 94:1736–1742.

49. Sheard NF, Clark NG, Brand-Miller JC, Franz MJ, Pi-Sunyer FX, Mayer Davis E, Kulkarni K, Geil P: Dietary carbohydrate (amount and type) in the prevention and management of diabetes: a statement of the American Diabetes Association. Diabetes Care 2004; 27:2266–2271.

50. Foster GD, Wyatt HR, Hill JO, McGuckin BG, Brill C, Mohammed BS, Szapary PO, Rader DJ, Edman JS, Klein S: A randomized trial of a low-carbohydrate diet for obesity. N Engl J Med 2003; 348:2082–2090.

51. Stern L, Iqbal N, Seshadri P, Chicano KL, Daily DA, McGrory J, Williams M, Gracely EJ, Samaha FF: The effects of low-carbohydrate versus conventional weight loss diets in severely obese adults: one-year follow-up of a randomized trial. Ann Intern Med 2004; 140:778–785.

52. Nordmann AJ, Nordmann A, Briel M, Keller U, Yancy WS Jr, Brehm BJ, and Bucher HC: Effects of low-carbohydrate vs low-fat diets on weight loss and cardiovascular risk factors: a meta-analysis of randomized controlled trials. Arch Intern Med 2006; 166:285–293.

53. Jenkins DJ, Wolever TM, Taylor RH, Barker H, Fielden H, Baldwin JM, Bowling AC, Newman HC, Jenkins AL, Goff DV: Glycemic index of foods: a physiological basis for carbohydrate exchange. Am J Clin Nutr 1981; 34:362–366.

54. Mayer-Davis EJ, Dhawan A, Liese AD, Teff K, Schulz M: Towards understanding of glycaemic index and glycaemic load in habitual diet: associations with measures of glycaemia in the Insulin Resistance Atherosclerosis Study. Br J Nut 2006; 95:397–405.

55. Brand-Miller J, Hayne S, Petocz P, Colagiuri S: Low-glycemic index diets in the management of diabetes: a meta-analysis of randomized controlled trials. Diabetes Care 2003; 26:2261–2267.

56. Liese AD, Schulz M, Fang F, Wolever TM, D'Agostino RB Jr, Sparks KC, Mayer-Davis EJ: Dietary glycemic index and glycemic load, carbohydrate and fiber intake, and measures of insulin sensitivity, secretion, and adiposity in the Insulin Resistance Atherosclerosis Study. Diabetes Care 2005; 28:2832–2838.

57. Rizkalla SW, Taghrid L, Laromiguiere M, Huet D, Boillot J, Rigoir A, Elgrably F, Slama G: Improved plasma glucose control, whole-body glucose utilization, and lipid profile on a low-glycemic index diet in type 2 diabetic men: a randomized controlled trial. Diabetes Care 2004; 27:1866–1872.

58. Garg A, Bantle JP, Henry RR, Coulston AM, Griver KA, Raatz SK, Brinkley L, Chen YD, Grundy SM, Huet BA, et al.: Effects of varying carbohydrate content of diet in patients with non-insulin-dependent diabetes mellitus. JAMA 1994; 271:1421–1428.

59. Heilbronn LK, Noakes M, Clifton PM: Effect of energy restriction, weight loss, and diet composition on plasma lipids and glucose in patients with type 2 diabetes. Diabetes Care 1999; 22:889–895.

60. Parker B, Noakes M, Luscombe N, Clifton P: Effect of a high-protein, high monounsaturated fat weight loss diet on glycemic control and lipid levels in type 2 diabetes. Diabetes Care 2002; 25:425–430.

61. Hu FB, van Dam RM, Liu S: Diet and risk of type II diabetes: the role of types of fat and carbohydrate. Diabetologia 2001; 44:805–817.

62. Summers LK, Fielding BA, Bradshaw HA, Ilic V, Beysen C, Clark ML, Moore NR, Frayn KN: Substituting dietary saturated fat with polyunsaturated fat changes abdominal fat distribution and improves insulin sensitivity. Diabetologia 2002; 45:369–377.

63. Salmeron J, Hu FB, Manson JE, Stampfer MJ, Colditz GA, Rimm EB, Willett WC: Dietary fat intake and risk of type 2 diabetes in women. Am J Clin Nutr 2001; 73:1019–1026.

64. Wang C, Harris WS, Chung M, Lichtenstein AH, Balk EM, Kupelnick B, Jordan HS: n-3 fatty acids from fish or fish-oil supplements, but not {alpha}-linolenic acid, benefit cardiovascular outcomes in primary- and secondary-prevention studies: a systematic review. Am J Clin Nutr 2006; 84: 5–17.

65. Kris-Etherton PM, Harris WS, Appel LJ: Fish consumption, fish oil, omega-3 fatty acids, and cardiovascular disease. Circulation 2002; 106:2747 - 2757.

66. Mozaffarian D, Bryson CL, Lemaitre RN, Burke GL, Siscovick DS: Fis intake and risk of incident heart failure. J Am Coll Cardiol 2005; 45:2015–2021.

67. Erkkila AT, Lichtenstein AH, Mozaffarian D, Herrington DM: Fish intake is associated with a reduced progression of coronary artery atherosclerosis in postmenopausal women with coronary artery disease. Am J Clin Nutr 2004; 80:626–632.

68. Gannon MC, Nuttall FQ: Effect of a high-protein, low-carbohydrate diet on blood glucose control in people with type 2 diabetes. Diabetes 2004; 53:2375–2382.

69. Gannon MC, Nuttall FQ, Saeed A, Jordan K, Hoover H: An increase in dietary protein improves the blood glucose response in persons with type 2 diabetes. Am J Clin Nutr 2003; 78:734–741.

70. Gannon MC, Nuttall JA, Damberg G, Gupta V, Nuttall FQ: Effect of protein ingestion on the glucose appearance rate in people with type 2 diabetes. J Clin Endocrinol Metab 2001; 86:1040–1047.

71. Howard AA, Arnsten JH, Gourevitch MN: Effect of alcohol consumption on diabetes mellitus: a systematic review. Ann Intern Med 2004; 140:211–219.

72. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, Hadden D, Turner RC, Holman RR: Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. BMJ 2000; 321:405–412.

73. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, Jones DW, Materson BJ, Oparil S, Wright JT Jr, Roccella EJ: The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. JAMA 2003; 289:2560–2572.

74. Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, Harsha D, Obarzanek E, Conlin PR, Miller ER III, Simons-Morton DG, Karanja N, Lin PH: Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet: DASH Sodium Collaborative Research Group. N Engl J Med 2001; 344:3–10.

75. Appel LJ, Brands MW, Daniels SR, Karanja N, Elmer PJ, Sacks FM: Dietary approaches to prevent and treat hypertension: a scientific statement from the American Heart Association. Hypertension 2006; 47:296–308.

76. Basic Carbohydrate Counting. Alexandria, Va and Chicago: American Diabetes Association and American Dietetic Association; 2003.

77. Carbohydrate Counting for People with Diabetes 3rd Edition. Park Nicollet Institute MN. International Diabetes Center (IDC), 2005.

78. Sallaya Kongsomboonvej. Food exchange list pocket guide. Theptarin General Hospital. 2003.

79. Food Exchange. Thai Association of Diabetes Educator. 2003.

80. Kathryn M Camelon, Karin Hadell, Paivi T. Jamsen et al. The Plate Model: A visual method of teaching meal planning. J Am Diet Assoc 1998; 98:1155-1158.

81. Idaho Plate Method. The 5 minutes meal plan.

82. Kicklighter JR. Characteristics of older adult learners: a guide for diabetics practitioners. J Am Diet Assoc 1991; 91:1418-1422.

83. Robert M. Anderson. In: Franz J, Ed. A core curriculum for diabetes education, Diabetes Education and Program Management, 5th ed. Chicago, Ill: American Association of Diabetes Educators; 2003: 3-12.

84. Anderson RM, Funnell MM. Compliance and adherence are dysfunctional concepts in diabetes care. Diabetes Educator. 2000; 2: 597-604.

85. Anderson RM, Funnell MM. From compliance to empowerment. In: The Art of Empowerment: Stories and strategies for diabetes educators. Alexandria, Va: American Diabetes Association; 2000:32-45.

86. Glasgow R, Anderson RM. In diabetes care moving from compliance to adherence is not enough: something entirely different is needed. Diabetes Care. 1999; 2090-2091.

87. Anderson RM. Patient empowerment and the traditional medical model: a case of irreconcilable differences. Diabetes Care. 1995; 18:412-415.

88. Anderson RM, Funnell MM, Butler P, Arnold MS, Fitzgerald JT, Feste CC. Patient empowerment: results of a randomized control trial. Diabete Care 1995; 18: 943-949.

89. Walker EA. Characteristics of the adult learner. Diabetes Care1999; 25(suppl6):16-24.

90. Darwin D. Dean, Charles Swencionis. Lifestyle counseling strategies for behavior change. In: Carson JS, eds. Cardiovascular Nutrition: Disease Management and Prevention. American Dietetics Association; 2004:81-105.

91. Kathleen Bauer, Carol Sokolik. Chapter 3: Meeting your client: The counseling interview. In: Basic Nutrition Counseling Skill Development 2002; 69-74.

92. Standards for outcomes measurement of diabetes self-management education (position statement). American Association of Diabetes Educators. The Diabetes educator 2003; 29 (5): 804-816.

93. Marilynn S. Arnold, Patricia M. Butler, Robert M. Anderson, Martha M. Funnell, and Catherine Feste. Guidelines for Facilitating a Patient Empowerment Program. The Diabetes Educator1995; 21(4):308-312.

94. Rubin RR, Napora JP. Behavior change. In: Franz MJ, Ed. A core curriculum for diabetes education fifth edition. Chicago, Ill. American Association of Diabetes Educators 2003; 67-92.

95. Caban A, Johnson P, Marseille D et al. Tailoring a lifestyle change approach and resources to the patient. Diabetes Spectrum 1999; 12:33-38.

96. Toobert DJ, Glasgow RE. Problem solving and diabetes self-care. J Behav Med 1991; 14:71-86.

97. Funnell et al., Implementing an empowerment-based diabetes self management education program. The Diabetes Educator 2005; 31(1):53-61.

98. Nothwehr F, Yang J. Goal setting frequency and the use of behavioral strategies related to diet and physical activity. Health Education Research 2006; Oct 10:7-14.

99. Locke EA, Latham GP. Building a practically useful theory of goal setting and task motivation: a 35-year odyssey. American Psychology 2002; 57:705 -717.

100. Paul A. Estabrooks, Candace C. Nelson, Stanley Xu et al. The Frequency and Behavioral Outcomes of Goal Choices in the Self management of Diabetes. The Diabetes Educator 2005; 31(3): 391-400.

101. Cullen KW, Baranowski T, Smith SP. Using goal setting as a strategy for dietary behavior change. J Am Diet Assoc 2001; 101(5):562-566.

102. Wallhagen MI. Social support in diabetes. Diabetes Spectrum 1999; 12:254-256.

103. Ura Suwannarat. Application of empowerment in self care of the diabetic patients at Sathinpra Hospital, Songkhla province. Master Thesis in Science (Public Health), Faculty of Graduate Studies, Mahidol University, 1999.

104. Supavadee Limpaphanont. The effectiveness of health promotion program on behavior changes of diabetic patients at Paholpolpayuhasana Hospital, Kanchanaburi Province. Master Thesis in Science (Public Health), Faculty of Graduate Studies, Mahidol University, 1999.

105. Surat Komindr. Cited in: Wannop Besuwan. Evaluation of the efficiency of modified method for self-control of diet and body weight in diabetic patients. Master Thesis in Science (Nutrition), Faculty of Graduate Studies, Mahidol University, 2000.

106. Hill-Briggs F. Problem solving in diabetes self-management:A model of chronic illness self-management behavior. Ann Behav Med 2003; 25(3):182-193.

107. Paterson B,Thorne S.Expert decision making in relation to unanticipated blood glucose levels. Research in Nursing and health 2000; 23:147-157.

108. Price MJ.An experimental model of learning diabetes self-management. Qualitative Health Research 1993; 3:29-54.

109. Brown SA. Met-analysis of diabetes patient education research: Variations in intervention effects across studies. Research in Nursing and Health 1992; 15:409-419.

110. Brown SA. Culturally competent diabetes education for Mexican Americans: the Starr County Study. Diabetes Educ 1999; 25(2):226-36.

111. Brown SA. Interventions to promote diabetes self-management:stage of science. Diabetes Educ 1999; 25(Suppl.): 52-61.

112. Glasgow RE,Anderson RM. In diabetes care, moving from compliance to adherence is not enough. Diabetes Care 1999; 22:2090-2091.

113. Chomyong Loachote. The effectiveness of health education program on self-care behavior among diabetes mellitus patients attending Photharam hospital clinic in Ratchaburi province. Master Thesis in Science (Public Health), Faculty of Graduate Studies, Mahidol University, 1993.

114. Tantayothai V. A follow up study of knowledge and state of disease control after receiving planned instruction and continued nursing helps in self care in uncontrolled diabetic adult patients. Master Thesis in Science (Nursing), Faculty of Graduate Studies, Mahidol University, 1993.

115. Poomdantam S. The effectiveness of systematic instruction of self care to disbetic patients at Kamalasai Hospital, Kalasin Province. Master Thesis in Science (Public Health), Faculty of Graduate Studies, Mahidol University, 1991.

116. Funnell MM, Nwankwo R, Gillard ML et al. Implementing an empowerment-based diabetes self-management education program. The Diabetes Educator 2005; 31(1):53-61.

117. Glasgow RE, Fisher L, Skaff M et al. Problem solving and diabetes self management. Diabetes Care 2007; 30(1):33-37.

118. Nothwehr F, Yang J. (2006). Goal setting frequency and the use of behavioral strategies related to diet and physical activity [Electronic version]. Health Education Research. Retrieved April 29, 2007.

119. Shilts MK, Horowitz M, Townsend MS. Goal setting as a strategy for dietary and physical activity behavior change: a review of the literature. Am J Health Promot 2004 Nov-Dec; 19(2):81-93.

120. Brekke HK, Jansson PN, Mansson JE, Lenner RA. Lifestyle changes can be achieved through counseling and follow-up in first-degree relatives of patients with type 2 diabetes. 2003; 103:835-843.

121. Mayer-Davis EJ, Sparks KC, Hirst K et al. Dietary intake in the Diabetes Prevention Program cohort: baseline and 1-year post randomization. Ann Epidemiol 2004; 14: 763-772.

122. Mulcahy K, Maryniul M, Peeples M. et al. Diabetes Self-Management Education Core Outcomes Measures. The Diabetes Educator 2003; 29 (5): 768-803.

123. Keeratiyutawong P. Self-care promotion program for diabetes at the level of a provincial hospital. Master Thesis in Science (Nursing), Faculty of Graduate Studies, Mahidol University, 1994.

124. Jelliffe DB. The assessment of the nutritional status of the community. Geneva: World Health Organization, 1966.

125. Harries AD, Jones LA, Healtly RV, Newcombe RG, and Rhodes J. Precision of anthropometric measurements: the value of midarm circumference. Clin Nutr 1984; 2:193-196.

126. Gibson RS. Priciples of Nutritional assessment. New York: Oxford University Press, 1990.

APPENDIX

APPENDIX 1

Questionnaires and forms

แบบสอบถามข้อมูลส่วนบุคคล

(Demographic information record form)

คำชี้แจง แบบสอบถามชุดนี้ จัดทำเพื่อต้องการรวบรวมข้อมูลพื้นฐานต่างๆเกี่ยวกับผู้เป็นเบาหวาน กรุณาตอบแบบสอบถามเกี่ยวกับตัวท่าน โดยทำเครื่องหมาย√ หรือเติมคำลงในช่องว่าง หน้าข้อความที่ตรงกับตัวท่านมากที่สุด

1. เพศ ☐ ชาย ☐ หญิง
2. อายุ.....ปี
3. ระดับน้ำตาลเฉลี่ย (HbA_{1c}).....เปอร์เซ็นต์ (%)
4. สถานภาพสมรส
   ☐คู่ ☐โสด ☐ หม้าย/ หย่า/ แยก

5. ระดับการศึกษา
   - ☐ ประถมศึกษา
   - ☐ มัธยมศึกษา
   - ☐ ประกาศนียบัตร
   - ☐ ปริญญาตรี หรือเทียบเท่า
   - ☐ สูงกว่าปริญญาตรี
   - ☐ ไม่เคยเข้ารับการศึกษา

6. อาชีพ
   - ☐ แม่บ้าน
   - ☐ ค้าขาย/ธุรกิจส่วนตัว
   - ☐ รับราชการ /รัฐวิสาหกิจ
   - ☐ รับจ้าง
   - ☐ อื่นๆระบุ.....

7. รายได้ต่อเดือน

☐ไม่มีรายได้

☐ น้อยกว่า 10000 บาท/ เดือน

☐ 10000-30000 บาท/ เดือน

☐ 30000-50000 บาท/ เดือน

☐ มากกว่า 50000 บาท/ เดือน

8. ท่านเป็นเบาหวานมานานเท่าใด ?

☐ เพิ่งทราบ ☐ .....เดือน/ ปี

9. ท่านรักษาเบาหวานด้วยวิธีใด ?

☐ ไม่เคยได้รับการรักษามาก่อน

☐ ใช้การควบคุมอาหารและ/หรือการออกกำลังกายเท่านั้น

☐ ใช้ยาเม็ดรักษาเบาหวาน

☐ ใช้ยาเม็ดรักษาเบาหวานร่วมกับฉีดอินซูลิน

☐ ใช้การฉีดอินซูลิน

☐ อื่นๆระบุ.....

10. ท่านรับประทานยาอะไรอยู่บ้างในขณะนี้ ?ระบุ

1).....4).....

2).....5).....

3).....6).....

11. ปัจจุบันท่านได้ทำการตรวจเช็คเลือดปลายนิ้วด้วยตนเองหรือไม่ ?

☐ ทำ ☐ ไม่ทำ

12. ท่านเคยมีประวัติภาวะแทรกซ้อนเฉียบพลันจากเบาหวานหรือไม่ ?

☐ อาการน้ำตาลในเลือดต่ำ ☐ ภาวะโคม่าจากน้ำตาลสูงมาก

☐ เคย ☐ ไม่เคย ☐ เคย ☐ ไม่เคย

13. ท่านเคยมีประวัติภาวะแทรกซ้อนเรื้อรังจากเบาหวานเหล่านี้หรือไม่ ?

☐ ยังไม่พบภาวะแทรกซ้อนเรื้อรัง

☐ โรคหัวใจและหลอดเลือดตีบตัน ☐ สมรรถภาพทางเพศเสื่อม

☐ เบาหวานขึ้นตา ☐ เบาหวานลงไต

☐ ปลายประสาทเสื่อม ☐ โรคของหลอดเลือดสมองตีบตัน

14. ท่านเคยมีประวัติเจ็บป่วยเหล่านี้หรือไม่ ?

☐ ไขมันในเลือดสูง

☐ เคย ☐ ไม่เคย

☐ ความดันโลหิตสูง

☐ เคย ☐ ไม่เคย

☐ อื่นๆระบุ.....

15. ท่านเคยได้รับความรู้หรือเข้าอบรมด้านอาหารสำหรับผู้เป็นเบาหวานจากนักกำหนดอาหารหรือไม่ ?

☐ ไม่เคย

☐ เคย, ถ้าเคย นานเท่าไรแล้ว.....เดือน / ปี

16. ท่านคิดว่าท่านมีความเข้าใจในการดูแลตนเองด้านอาหารเมื่อเป็นเบาหวานมากแค่ไหน ?
กรุณาให้คะแนนตัวเอง...โดยการเขียนเครื่องหมายวงกลมล้อมรอบตัวเลข

0 10 20 30 40 50 60 70 80 90 100

คะแนน

.....

แบบวัดความสามารถในการแก้ไขปัญหาในสถานการณ์จำลองด้านอาหาร

(Problem solving dietary scenarios test, PSDS)

ผู้ประเมินลำดับที่.....HN.....วันที่.....

คำชี้แจงในการตอบแบบวัด แบบวัดชุดนี้ประกอบด้วยข้อคำถาม 5 ข้อแต่ละข้อถามถึงการตอบสนองทางพฤติกรรมของผู้เป็นเบาหวานชนิดที่ 2 ในการจัดการแก้ไขปัญหาในสถานการณ์จำลองด้านอาหารที่อาจเกิดขึ้นจริงในชีวิตประจำวัน เพื่อนำข้อมูลที่ได้รับมาเป็นแนวทางในการพัฒนารูปแบบของการให้คำปรึกษาด้านอาหารที่สนับสนุนและส่งเสริมให้ผู้เป็นเบาหวานสามารถดูแลตนเองโดยการแก้ไขปัญหา ในสถานการณ์ด้านอาหารในชีวิตประจำวันได้อย่างเหมาะสมและมีประสิทธิภาพ

ขอให้ท่านพิจารณาข้อความแต่ละข้อ โปรดตอบคำถามให้ครบทุกข้อโดยการเขียนอธิบายว่า....

ในกรณีเกิดเหตุการณ์เหล่านี้กับท่านจริงๆ...ท่านจะตอบสนองต่อเหตุการณ์นี้อย่างไร ?

ตัวอย่างเช่น...

6. เมื่อถึงคราวที่ไปเที่ยว...ไม่ว่าจะไปกับลูกหลานหรือเพื่อนฝูงจะรู้สึกสดชื่นและผ่อนคลาย ในบรรยากาศที่สดชื่น สวยงาม มีอาหารหลากหลายเมนูที่น่ารับประทานให้เลือก

คุณตอบสนองต่อเหตุการณ์นี้อย่างไร?

“.....

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”

แบบวัดความสามารถในการแก้ไขปัญหาในสถานการณ์จำลองด้านอาหาร

(Problem solving dietary scenarios test, PSDS)

1. **ถ้าในสัปดาห์หน้าจะถึงวันครบรอบวันเกิดของคุณ...ทุกปีจะจัดงานเลี้ยงฉลองและคุณทราบว่าจะต้องมีอาหารที่คุณชอบ เห็นแล้วอดไม่ได้ ที่ผ่านมาก็จะต้องรับประทาน ทำให้ระดับน้ำตาลในเลือดสูงขึ้นทุกปี...สำหรับวันเกิดปีนี้ของคุณ...**

   คุณตอบสนองต่อสถานการณ์นี้อย่างไร...?

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2. **ในที่ทำงานของคุณ...เพื่อนๆซื้อขนมหวานมันตามแบบที่คุณชอบมาวางไว้บนโต๊ะประจำที่คุณและเพื่อนๆเคยรับประทานร่วมกัน...มีให้รับประทานได้ตลอดช่วงเวลาทำงาน...**

   คุณตอบสนองต่อสถานการณ์นี้อย่างไร...?

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.....

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3. **ที่บ้านของคุณ...ลูกหลาน ญาติสนิท เพื่อนฝูง มักชอบซื้ออาหารมาฝากให้เป็นประจำ บางครั้งคุณไม่ได้รู้สึกหิวหรืออยากรับประทาน แต่ก็ต้องรับประทานเพื่อเอาใจญาติพี่น้องที่นำมาให้ คุณตอบสนองต่อสถานการณ์นี้อย่างไร ?**

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4. **คุณเป็นคนหนึ่งที่จำเป็นต้องรับประทานอาหารนอกบ้าน...ปกติจะรับประทานอาหารมื้อเช้าและกลางวันที่ทำงานหรือร้านค้าใกล้เคียงเป็นประจำ มีอาหารให้เลือกไม่มากนัก มักมีร้านข้าวแกง ก๋วยเตี๋ยว ลูกชิ้นปิ้ง/ทอด น้ำอัดลม/น้ำผลไม้ และมีรถเข็นขายผลไม้อยู่หน้าที่ทำงาน...คุณตอบสนองต่อสถานการณ์นี้อย่างไร...?**

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5. **วันหนึ่ง...คุณมีเรื่องที่ต้องทำให้หนักใจ ไม่ว่าจะเป็นเรื่องงานประจำ ธุรกิจส่วนตัว เรื่องลูกหลาน...เมื่อคุณมีเรื่องกังวลหรือเครียดกับเรื่องใด...คุณจะรับประทานอย่างไร?**

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แบบบันทึกรายการอาหารที่รับประทานใน 3 วัน
(3-day food record)

คำแนะนำในการบันทึก

1. ให้บันทึกการรับประทานอาหาร 3 วัน ก่อนพบผู้วิจัย (วันธรรมดา 2 วันและวันหยุด 1 วัน)
2. ให้บันทึกอาหารที่ท่านรับประทานทุกชนิดรวมทั้งขนมและเครื่องดื่ม ทุกครั้ง ทุกมื้อ ทั้งในบ้านและนอกบ้าน ตลอดทั้งวัน ตั้งแต่เริ่มตื่นนอนจนกระทั่งเข้านอน
3. ให้บันทึกอาหารที่ท่านรับประทานปกติธรรมดา มิใช่เป็นมื้อพิเศษเช่นงานเลี้ยงแต่งงาน เป็นต้น
4. ข้อความต่อไปนี้เป็นสิ่งจำเป็นในการบันทึก
    1) บันทึกแหล่งที่มาของอาหารเช่นทำกินเอง ซื้อ ถ้าซื้อให้ระบุว่าซื้อจากแหล่งใดเช่น ซื้อจากตลาดซื้อจากร้านที่ทำงานริมถนนมีคนนำมาให้ หรือเป็นอาหารว่างในงานประชุม
    2) กรณีปรุงอาหารเอง ให้บันทึกปริมาณ การเติม น้ำมัน หรือกะทิ ลงในอาหารด้วย เช่น น้ำตาลทราย 2 ช้อนชา น้ำมันกระเทียมเจียว 1 ช้อนชา ในก๋วยเตี๋ยวราดหน้า
    3) ถ้าไม่สามารถประมาณได้ ให้พยายามบันทึกในรูปขนาดเช่นขนาดเล็ก กลาง ใหญ่ หรือขนาดกว้าง×ยาวของอาหารชนิดนั้น เช่น หมูทอด 2 ชิ้น ขนาดชิ้นละ2×2 นิ้ว ไก่ย่าง 1 น่องใหญ่ไม่ติดหนัง แตงกวา ครึ่งลูกใหญ่ โคล่า1 กระป๋องหรือ325 มล.
    4) ระบุส่วนประกอบของอาหารแต่ละชนิดและลักษณะการปรุงอาหาร เช่น ต้ม นึ่ง ย่าง อบ ยำ ตุ๋น พร้อมทั้งบอกปริมาณ/ปริมาตร
        - ***ของแข็งให้ระบุเป็นช้อนตวงหรือทัพพี*** เช่นผัดผักกาดขาวหมูสับ ควรระบุดังนี้ ผักกาดขาว 2 ทัพพีพูน หมูสับ 2 ช้อนโต๊ะหรือช้อนกินข้าว น้ำมันพืช ถ้าทราบชนิดของน้ำมันให้ระบุ เช่น น้ำมันถั่วเหลืองประมาณ 1 ช้อนโต๊ะ

- ***ของเหลวระบุเป็นซีซี(มล.) หรือขนาด เล็ก กลาง ใหญ่*** เช่นกาแฟ 1 แก้ว ควรระบุดังนี้ น้ำตาลทราย 2 ช้อนชา นมพร่องมันเนย 2 ช้อนโต๊ะ หรือ น้ำอัดลม 1 ขวดขนาดกลาง หรือ 140 มล.
- ***ของหวานหรือขนมเป็นซองให้ระบุเป็นขนาด จำนวนชิ้น ห่อหรือส่วนประกอบของภาชนะที่ใส่*** เช่น เค๊กไม่มีหน้า 1 ชิ้นเล็ก ขนาด2นิ้ว×2 นิ้ว หรือ ขนมกรุบกรอบ 1 ซองเล็ก (ขนาดซองละ 5 บาท) หรือ ขนมน้ำแข็งใส 1 ถ้วยเล็ก เป็นต้น
- ***อาหารที่มีส่วนผสมหลากหลายให้ระบุจำนวนชิ้น ขนาด หรือ ส่วนของภาชนะที่ใส่ เช่น*** ซาลาเปาไส้หมูสับ 1 ลูก (ขนาดปกติ) เป็นต้น
- ***ผลไม้ให้ระบุเป็นขนาดผล เล็ก กลาง ใหญ่ หรือจำนวนชิ้นคำ*** เช่น ฝรั่ง 1 ผลเล็ก หรือ มังคุด 4 ผล หรือ แตงโม 10 ชิ้นขนาดคำ เป็นต้น

รหัส.....

แบบบันทึกการรับประทานอาหารใน 3วัน วันที่ .....

มื้ออาหาร	เวลา	แหล่งที่มาของอาหาร	รายละเอียดอาหารที่รับประทาน	
			ประเภทอาหาร	ปริมาณ

รหัส.....

แบบบันทึกการรับประทานอาหารใน 3วัน วันที่.....

มื้ออาหาร	เวลา	แหล่งที่มาของอาหาร	รายละเอียดอาหารที่รับประทาน	
			ประเภทอาหาร	ปริมาณ

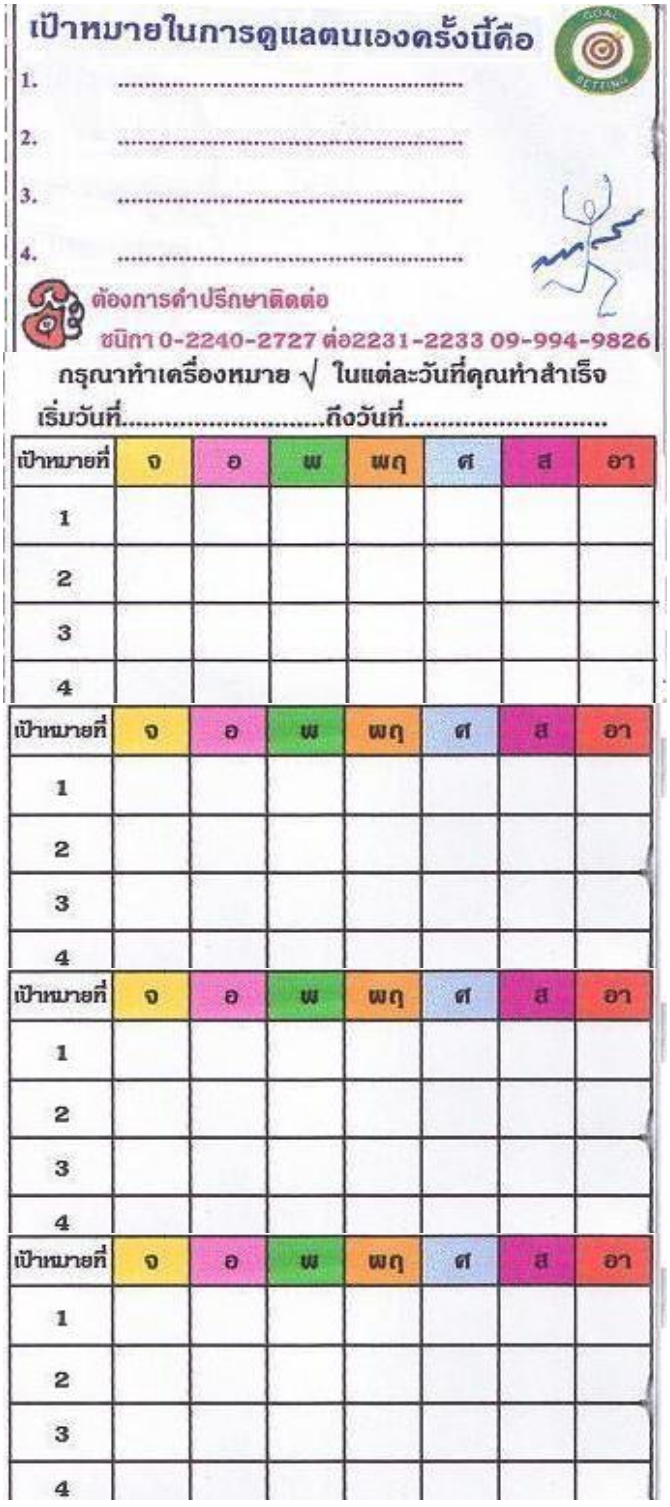
รหัส.....

แบบบันทึกการรับประทานอาหารใน 3วัน วันที่.....

มื้ออาหาร	เวลา	แหล่งที่มาของอาหาร	รายละเอียดอาหารที่รับประทาน	
			ประเภทอาหาร	ปริมาณ

Example of portable personal goal card

Front



เป้าหมายในการดูแลตนเองครั้งนี้คือ

1. .....
2. .....
3. .....
4. .....

ต้องการคำปรึกษาติดต่อ

ชนิกา 0-2240-2727 ต่อ2231-2233 09-994-9826

กรุณาทำเครื่องหมาย √ ในแต่ละวันที่คุณทำสำเร็จ

เริ่มวันที่.....ถึงวันที่.....

เป้าหมายที่	จ	อ	พ	พฤ	ศ	ส	อา
1							
2							
3							
4							

เป้าหมายที่	จ	อ	พ	พฤ	ศ	ส	อา
1							
2							
3							
4							

เป้าหมายที่	จ	อ	พ	พฤ	ศ	ส	อา
1							
2							
3							
4							

เป้าหมายที่	จ	อ	พ	พฤ	ศ	ส	อา
1							
2							
3							
4							

Back

Measurements	**Visits**						
	week-1	week0	week2	week4	week8	week12	week16
Consent Form	X						
Physical Exam	X						
Medical History	X						
Anthropometry							
BW		X	X	X	X	X	X
Height		X					
BMI		X	X	X	X	X	X
Waist, Hip		X	X	X	X	X	X
BP		X	X	X	X	X	X
TSF		X	X	X	X	X	X
MAC		X	X	X	X	X	X
%Body Fat		X					X
Lab							
FBS		X			X		X
HbA_{1c}		X			X		X
Lipid profile		X			X		X
Questionnaires							
Demography[1]	X						
PSDS Test[2]	X						X
Semi-QFFQ[3]	X						X
Counseling	X	X	X	X	X	X	X
Data Collections							
3-day food record		X	X	X	X	X	X
Personal goal card		X	X	X	X	X	X
SMBG printout form		X	X	X	X	X	X

Anthropometric measurement and biochemistry record form ID……Date……

Demography[1]= Demographic information questionnaire
PSDS[2]= **P**roblem **S**olving **D**ietary **S**cenario **T**est
Semi-QFFQ[3] = Semi-Quantitative Food Frequency Questionnaire

แบบสอบถามความถี่ในการบริโภค
(Semi-Quantitative Food Frequency Questionnaire)

ตัวอย่าง

ในช่วง 1 เดือนที่ผ่านมาได้รับประทาน.....

- ข้าวต้ม โจ๊ก ไม่บ่อย เดือนละ 1-2 ครั้ง ครั้งละ 4 ทัพพี (2 ส่วน)
- ไม่เคยกินซีเรียล
- ข้าวสวยทุกวัน วันละ 3 มื้อ มื้อละ 2 ทัพพี (2 ส่วน)
- วุ้นเส้น วันเว้นวัน ครั้งละ 1 ทัพพี (1 ส่วน)
- ก๋วยเตี๋ยว สัปดาห์ละ 1-2 ครั้ง ครั้งละ 2 ทัพพี (2 ส่วน)

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
หมวดข้าว/แป้ง/ถั่ว/เมล็ดธัญพืช												
เมล็ดธัญพืช/ผลิตภัณฑ์จากธัญพืช												
ข้าวต้ม,โจ๊ก	2 ทัพพี	2									✓	
ซีเรียลไม่เคลือบน้ำตาล	1 1/2 ทัพพี	-	✓									
ข้าวสวย	1 ทัพพี	2				✓						
วุ้นเส้นสุก	1 ทัพพี	1							✓			
ก๋วยเตี๋ยว:เส้นหมี่,เส้นเล็ก,เส้นใหญ่	2 ทัพพี	2						✓				

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
เมล็ดเกาลัด	6 ลูก											
ขนมจีน	1 1/2 ทัพพี											
เกี๊ยว	4 แผ่น											
ข้าวเหนียว	1/2 ทัพพี											
โจ๊ก ข้าวต้มกึ่งสำเร็จรูป	1 ซอง											
ถั่วเมล็ดแห้งสุก												
ถั่วแดง / ถั่วดำ / ถั่วเขียว	1 ทัพพี											
ผักที่มีแป้งสูง												
ข้าวโพด	1ฝักขนาดกลาง											
เมล็ดข้าวโพด/เมล็ดถั่วลันเตา	1 ทัพพี											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
มันฝรั่ง/มันเทศ/เผือก หัวขนาดกลาง	1 ทัพพี											
ฟักทองสุก	2 ทัพพี											
แห้ว	1 ทัพพี											
มันแกว	4 ทัพพี											
ขนมปัง												
ขนมปังปอนด์ ขนมปังแผ่น ขนมปังโฮลวีท	1 แผ่น											
ขนมปังแฮมเบอร์เกอร์	$^1/_2$ คู่											
ขนมปังกรอบจืดชิ้นสี่เหลี่ยม ขนาด 2 $^1/_2$ นิ้ว	3 แผ่น											
ขนมปังกรอบจืดชิ้นสี่เหลี่ยมขนาด 1 $^1/_2$ นิ้ว	6 แผ่น											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
หมวดผลไม้												
กล้วยหอม	$^1/_2$ ผล											
กล้วยน้ำว้า,กล้วยไข่	1 ผล											
ทุเรียน	1 พูเล็ก (5 ชิ้นพอคำ)											
ส้มโอ	2 กลีบ											
มะขามหวาน	2 ฝัก											
ชมพู่	4 ผล											
มังคุด	4 ผลเล็ก											
ลำไย	6 ผลใหญ่											
สับปะรด	6 ชิ้นพอคำ											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
ผลไม้กวน												
ทุเรียนกวน	1 ช้อนโต๊ะ											
ผลไม้กระป๋อง												
เงาะ,ลำไย,ลิ้นจี่	3 ช้อนโต๊ะ											
น้ำผลไม้												
น้ำองุ่น,น้ำพรุน,น้ำผลไม้รวม	1/3 แก้ว (80 ซีซี)											
น้ำส้มคั้น,น้ำฝรั่ง,น้ำสับปะรด	1/2 แก้ว (120 ซีซี)											
น้ำแอปเปิ้ล	1/2 แก้ว (120 ซีซี)											
น้ำมะพร้าว	1/2 แก้ว (120 ซีซี)											
น้ำผักผลไม้รวม	1/2 แก้ว (120 ซีซี)											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
น้ำแครอท	1/2 แก้ว (120 ซีซี)											
น้ำผลไม้ 100 %	1/2 แก้ว (120 ซีซี)											
น้ำผลไม้ 40 %	1 แก้ว (240 ซีซี)											
หมวดผัก												
กลุ่มผักที่รับประทานได้ไม่จำกัด												
เช่นผักกาดหอม,ผักกาดแก้ว	1 ทัพพี(สุก) 2 ทัพพี(ดิบ)											
ผักกาดขาว ผักปวยเล้ง ผักกวางตุ้ง	1 ทัพพี(สุก) 2 ทัพพี(ดิบ)											
ผักปุ้ง, ตำลึง, ยอดฟักทอง,	1 ทัพพี(สุก) 2 ทัพพี(ดิบ)											
หัวไชเท้า,ฟักเขียว,น้ำเต้า,บวบ	1 ทัพพี(สุก) 2 ทัพพี(ดิบ)											
แตงกวา, ถั่วงอก, หัวปลี, มะเขือ	1 ทัพพี(สุก) 2 ทัพพี(ดิบ)											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
กลุ่มผักอื่นๆ (ยกเว้นผักที่มีแป้งมาก)												
เช่น ผักคะน้า,ผักกระเฉด,เห็ด	1 ทัพพี(สุก) 2 ทัพพี(ดิบ)											
ถั่วฝักยาว,ถั่วแขก,ฝักถั่วลันเตา	1 ทัพพี(สุก) 2 ทัพพี(ดิบ)											
แครอท, มะละกอดิบ	1 ทัพพี(สุก) 2 ทัพพี(ดิบ)											
บร็อคโคลี่, ดอกกระหล่ำ,	1 ทัพพี(สุก) 2 ทัพพี(ดิบ)											
กระหล่ำปลี เป็นต้น	1 ทัพพี(สุก) 2 ทัพพี(ดิบ)											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
ผักแห้ง												
หน่อไม้จีน	1 ทัพพี											
สาหร่าย	$^1/_2$ ทัพพี											
หมวดนมและผลิตภัณฑ์นม												
นมไขมัน 0%	1 กล่อง (240 ซีซี)											
นมพร่องมันเนย,โยเกิร์ตขาดไขมัน	1 กล่อง (240 ซีซี)											
นมเต็มไขมัน	1 กล่อง (240 ซีซี)											
นมเต็มไขมันรสหวาน,นมเปรี้ยว	$^1/_2$ กล่อง (120 ซีซี)											
นมถั่วเหลืองผสมน้ำตาล	$^1/_2$ กล่อง (120 ซีซี)											
นมถั่วเหลืองไม่ผสมน้ำตาล	1 กล่อง (240 ซีซี)											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร									หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
นมถั่วเหลืองแลคตา ซอย สูตรเจ	1กล่อง(300ซีซี)											
โยเกร์ตผลไม้	1 กล่อง(180 ซีซี)											
เครื่องดื่ม												
น้ำอัดลม	1/3 แก้ว/กระป๋อง (80 ซีซี)											
ชาดำเย็น / กาแฟเย็น	1/2 แก้ว(80 ซีซี)											
กาแฟ 3 in 1	1 ซอง											
ชาเขียวพร้อมดื่ม(ผสมน้ำตาลฟรุ๊คโตส)	1/2 ขวด(150ซีซี)											
ชาเขียวพร้อมดื่ม(สูตรชูการ์ฟรี)	1ขวด(300ซีซี)											
น้ำมะเขือเทศ	1 แก้ว(240ซีซี)											
น้ำผักปั่นที่ไม่เติมน้ำตาล,น้ำผึ้ง ฟรุ๊คโตส, ผลไม้	1 แก้ว(240ซีซี)											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร									หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
ขนมหวาน												
ขนมนึ่งโรยน้ำตาล,มะพร้าว												
ฟักทองนึ่งโรยมะพร้าว	1/2 ของชิ้นที่ขาย											
ขนมกล้วย,ขนมตาล,ขนมมัน	1 ชิ้นที่ขาย											
ขนมหวานที่มีน้ำตาล,แป้ง,กะทิ												
ฟักทองแกงบวด,แกงบวดเผือก, กล้วยบวดชี	1/2 ถ้วยขนมหวาน											
เต้าส่วน, สาคูเปียก	1/2 ถ้วยขนมหวาน											
บัวลอยเผือก,ต้มถั่วดำใส่กะทิ	1/2 ถ้วยขนมหวาน											
ขนมครก	2 คู่											
ตะโก้แห้ว, เผือก,วุ้นกะทิ,ขนมชั้น	2 ชิ้นพอคำ											

หมายเหตุ : ถ้วยขนมหวานเส้นผ่านศูนย์กลาง 4 นิ้ว

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
ข่าหริ่มน้ำกะทิ,ลอดช่องน้ำกะทิ, ทับทิมกรอบ	½ ถ้วยขนมหวาน											
เผือกน้ำกะทิ,กะทิแดงไทย	½ ถ้วยขนมหวาน											
ข้าวเหนียวหน้าต่างๆ												
ข้าวเหนียวมูลหน้าต่างๆ	3 ช้อนพอคำ											
ข้าวต้มมัดไส้ถั่วดำ	1ชิ้น (3ชิ้นพอคำ)											
ขนมทอด												
ปาท่องโก๋	1 คู่ ขนาด 2½ นิ้ว											
กล้วยแขก,มันทอด,เผือกทอด	2 ชิ้น											
ไข่นกกระทา (ขนมไข่เต่า)	3 ลูก											
กุยฉ่ายทอด , กุยฉ่ายนึ่ง	1 ชิ้น ขนาด 2½ X 2½ นิ้ว											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
ขนมน้ำแข็งใสต่างๆ												
เฉาก๊วย ข้าวต้มน้ำวุ้น	1 ถ้วยขนมหวาน											
ขนมอื่นๆและอาหารว่าง												
สาคูไส้ต่างๆ,ปิ้นขลิบ, ขนมลูกชุบ	3 ชิ้นขนาดพอคำ											
กะยาสารท	1 ชิ้น ขนาด 1x1x1นิ้ว											
ขนมไหว้พระจันทร์ ไส้ทุเรียน	½ ชิ้น ขนาด 3x1½ นิ้ว											
สะเก๋า ขนมจีบ	3 ชิ้น											
ซาลาเปา	1 ลูก ขนาด 2 นิ้ว											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
ลูกอม ทอฟฟี่	3 เม็ด											
แยม,น้ำผึ้ง,น้ำตาล,น้ำเชื่อม, นมข้นหวาน	1 ช้อนโต๊ะ											
เบเกอรี่ต่างๆ												
เค้กไม่มีหน้า	1 ชิ้น ขนาด 2X2 นิ้ว											
เค้กมีหน้า	$^1/_2$ ชิ้น ขนาด 2X2นิ้ว											
คุ๊กกี้ ขนาดเส้นผ่านศูนย์กลาง $1\ ^1/_2$ นิ้ว	2 ชิ้น											
บราวนี่ (ไม่มีหน้า)	1 ชิ้น ขนาด 2X2 นิ้ว											
ครัวซองค์ ,พัฟ , พาย ขนาด 4 นิ้ว	1 ชิ้น											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
อาหารฟาสฟู้ด												
แซนด์วิช แฮมเบอร์เกอร์	1 ชิ้น (1 คู่)											
พิซซ่า (แบบบางถาดกลาง)	$^1/_8$ ของถาด12 นิ้ว											
เฟรนช์ฟราย	1 ถุงขนาดกลาง											
ไอศกรีม	1 ถ้วย											
ซูชิ (ก้อนยาว) 1 X $1\ ^1/_2$ นิ้ว	1 ชิ้น											
ซูชิ (ก้อนเล็ก) 1 X 1 นิ้ว	3 ชิ้น											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
หมวดเนื้อสัตว์												
เนื้อปลา,ปลาทูน่ากระป๋อง, ปลากระป๋อง	2 ช้อนโต๊ะ											
เนื้อเป็ด เนื้อไก่ ไม่ติดหนัง	2 ช้อนโต๊ะ											
เนื้อเป็ด เนื้อไก่ ติดหนัง	2 ช้อนโต๊ะ											
เป็ด ไก่ ส่วนสะโพก / น่อง	2 ช้อนโต๊ะ											
ไก่ทอดติดหนัง ปลาทอด	2 ช้อนโต๊ะ											
เนื้อหมู เนื้อวัว ไม่ติดมัน	2 ช้อนโต๊ะ											
เนื้อหมู เนื้อวัว ติดมัน	2 ช้อนโต๊ะ											
ซี่โครงหมู ขนาด $1\frac{1}{2}$ นิ้ว	6 ชิ้น											
หนังหมู หมูบด กุนเชียง	2 ช้อนโต๊ะ											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
หมูยอ แหนม	2 ช้อนโต๊ะ											
หมูหยอง	5 ช้อนโต๊ะ											
หมูแผ่น ขนาด 3 X 3 นิ้ว	2 แผ่น (5 ช้อนโต๊ะ)											
ไส้กรอกหมู ขนาด $2\frac{1}{2}$ นิ้ว	1 แท่ง											
ไส้กรอกอีสานขนาด $2\frac{1}{2}$ นิ้ว	1 แท่ง											
เครื่องในสัตว์	2 ช้อนโต๊ะ											
ลูกชิ้นไก่ เนื้อ ปลา หมู	6 ลูก											
ไข่ขาว	2 ฟอง											
ไข่ทั้งฟอง	1 ฟอง											
ไข่เค็ม	1 ฟอง											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
เนยแข็ง , แฮม	1 แผ่น											
เบคอน	3 แผ่น											
ปูกุ้ง,หอย,ปลาหมึก	2 ช้อนโต๊ะ											
โปรตีนเกษตร ทดแทนเนื้อสัตว์												
โปรตีนเกษตร	1 ทัพพี											
เต้าหู้หลอด เต้าหู้ไข่ไก่	$^1/_2$ หลอด											
เต้าหู้เหลือง เต้าหู้ขาว เต้าหู้แข่ในน้ำ ทั้งชนิดนิ่มและแข็ง	$^1/_2$ แผ่น											
ฟองเต้าหู้	1 ทัพพี											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
หมวดไขมัน												
เนื้อสัตว์ทอด	2 ช้อนโต๊ะ											
เนื้อสัตว์ผัด	2 ช้อนโต๊ะ											
เนื้อสัตว์ ชุบแป้งทอด	2 ช้อนโต๊ะ											
ผัดผัก ไม่ราดน้ำ	1 ทัพพี											
ผัก ชุบแป้งทอด	1 ทัพพี											
น้ำกะทิ แกงกะทิ	1 ช้อนโต๊ะ											
เบคอนทอด	1 ชิ้น											
ไส้หมู	2 ช้อนโต๊ะ											
เนยถั่ว	1 ช้อนโต๊ะ											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
คอฟฟี่เมท	2 ช้อนชา											
มาการีน(เนยเทียม),มายองเนส, เนย	1 ช้อนชา											
น้ำสลัดชนิดข้น	1 ช้อนชา											
น้ำสลัดชนิดใส (มีน้ำมัน)	1 ช้อนโต๊ะ											
ถั่วลิสง	20 เมล็ด (10 ฝัก)											
เมล็ดมะม่วงหิมพานต์/เมล็ดอัลมอนด์	6 เมล็ด											
เมล็ดทานตะวัน/เมล็ดฟักทอง	1 ช้อนโต๊ะ											
งา	1 ช้อนโต๊ะ											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
อื่นๆ												
ผักกาดกระป๋อง	½ กระป๋อง											
น้ำปลา ซีอิ๊ว ซอสถั่วเหลืองปรุงรส	1 ช้อนชา											
ซอสหอยนางรม	1 ช้อนโต๊ะ											
น้ำจิ้มไก่, น้ำจิ้มบ๊วยเจี่ย	1 ช้อนโต๊ะ											
น้ำจิ้มสุกี้	4 ช้อนโต๊ะ											
น้ำพริกเผา	1 ช้อนโต๊ะ											

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
ผลิตภัณฑ์เสริมอาหาร												
วิตามิน บีรวม ซี อี แคลเซียม เหล็ก	1 เม็ด											
ซุปไก่สกัดชนิดเม็ด	1 เม็ด											
ซุปไก่สกัด พรุนสกัด รังนก (มีน้ำตาล)	1 ขวดเล็ก (ขนาด 55 ซีซี)											
ซุปไก่สกัด พรุนสกัด รังนก (มีน้ำตาล)	1 ขวดใหญ่ (ขนาด 70 ซีซี)											
รังนกชนิดไม่มีน้ำตาล (ชูก้าร์ฟรี)	1 ขวดเล็ก (ขนาด 55 ซีซี)											
รังนกชนิดไม่มีน้ำตาล (ชูก้าร์ฟรี)	1 ขวดใหญ่ (ขนาด 70 ซีซี)											
อื่นๆ ระบุ.....												

รายการอาหาร	ปริมาณอาหารใน 1 ส่วน	ปริมาณที่รับประทานเป็นประจำต่อครั้ง	ความถี่ในการรับประทานอาหาร								หมายเหตุ
			ไม่รับประทาน	จำนวนครั้ง/วัน				จำนวนครั้ง/สัปดาห์			จำนวนครั้ง/เดือน	
				1	2	3	>3	1-2	3-4	5-6	1-3	
อื่นๆ ระบุ.....												

APPENDIX 2

The dietary practical information

Goals	Alternative behavior options
Reduced CHO intake	
• ***Reduced rice intake***	- Limit portion size of rice no more than 1/4 of the plate - Use CHO counting and follow by quotas management - Reduce rice consumption by half
• ***Reduced intake of high-glycemic index CHOs***	- Limit portion size for potatoes, corn, pumpkin, and other starchy vegetables then count as CHO*. - Avoid white bread, glutinous rice**,** yellow egg noodle - Try mungbeen noodle, brown rice, rice noodle, whole wheat bread
• ***Reduced fruits intake***	- Eat fruit daily but no more than a fruit plate, or a cup per meal - Visualize the amount of fruit equivalent to the size of one fist per meal
• ***Reduced sweet/dessert and late night snack***	- Choose one portion of fruit, healthy fat milk, or a fist of nut - Limit portion size by half
• ***Reduced sweetened drinks***	- Decrease the amount by half - Choose a smaller size bottle - Share portions - Use sweetener instead of sugar - More assertive and refuse to buy - Decrease the frequency by half
Increased leafy vegetables intake	- Eat leafy more than starchy vegetables - Use plate model, vegetables cover 1/2 of the plate - Order extra vegetables when eat out -

***** Note: If you eat 1 ½ cups cooked at a meal that is equal to one carbohydrate choice.

Figure 3.1 Dietary goals and alternative behavior options given to achieve in carbohydrate reduction goals

Goals	Alternative behavior options
Reduced fat intake	
• ***Reduced intake of saturated fat***	- Choose low-fat or non-fat milk, and low-fat meat products - Choose cooking method without oil - Reduce frying by half - Use fat counting and follow by quotas management - Eat out less often (if reasonable) - Eat less bakery by sharing with others or do not walk nearby the bakery shop - Eat less with coconut milk
• ***Increased intake of monounsaturated fat and omega-3***	- Eat at least one fist of nut per day - Choose olive oil or canola oil (if offered) - Choose fatty fish or deep marine fish at least every other day

Figure 3.2 Dietary goals and alternative behavior options given to achieve fat reduction goals

Goals	Alternative behavior options
increased dietary protein intake	
• ***Increased intake of dietary protein***	- Use plate model as a guide tool, dietary proteins cover 1/4 of the plate - Visualize the amount of very lean and lean meat equivalent to the size of one palm - Order extra low-fat meat - Choose grill low-fat meat as a snack (such as grilled meatballs, fish balls) - Choose boiled beans (such as green bean, kidney bean) - Remember to eat fish daily

Figure 3.3 Dietary goals and alternative behavior options given to achieve protein goals

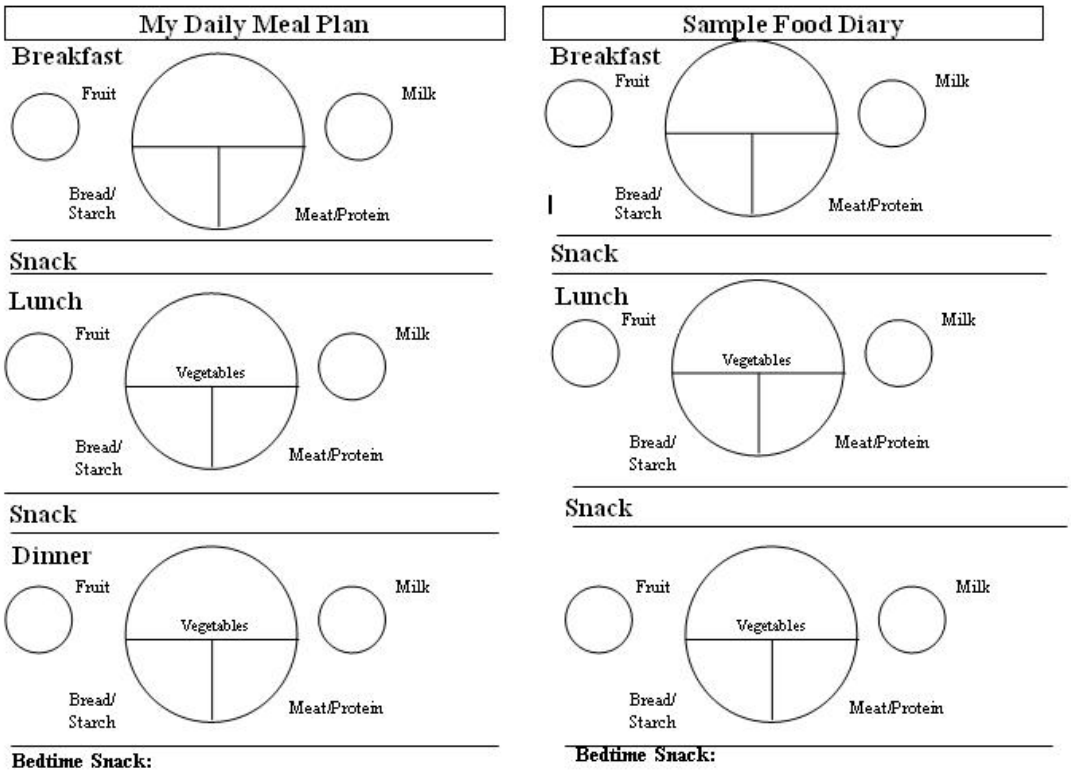


Figure 3.4 Plate Method

The Three Steps of Carbohydrate Counting
Step 1. Identifying carbohydrate Foods ***Step 2.*** Identifying a Carbohydrate Choice: One carbohydrate choice is the same as 15 grams of carbohydrate or one serving of carbohydrate. ***Step 3.***Counting Choices in a Meal
Source: *Carbohydrate Counting for People with Diabetes 3rd Edition.* International Diabetes Center 2005

Figure 3.5 Carbohydrate counting for people with type2 diabetes

Orange Juice
Nutrition Facts **Serving Size: 8 fluids oz.** Serving Per Container:3
Amount per serving **Calories 120** Calories from Fat 0
Total Fat 0g
Saturated fat 0 g Cholesterol 0 mg Sodium 0 mg
Total Carbohydrate 30 g **Sugars** 30 g **Fiber** 0 g **Protein** 0 g

Serving Size: All the information on the label is based on this portion. If you eat double in serving size, you will eat double in carbohydrate, other nutrients, and calories. **Servings per Container:** This is the total number of servings in the package.

Total Carbohydrate: This lists the total grams of carbohydrate in one serving. The total includes dietary fiber and sugars, which are broken out below.

Figure 3.6 Food labeling

APPENDIX 3

Table4.52 Changes of serum creatinine after intervention

Initial	Cr (mg/dl)*	
	Week 0	**Week 16**
KN	0.7	0.7
BK	1.0	1.0
KT	1.2	1.1
SP	0.6	0.6
VV	0.5	0.5
PS	0.9	1.1
NL	0.5	0.7
NA	0.7	0.8
TP	0.8	0.8
MN	1.1	1.1
SP	0.7	0.7
TC	1.0	1.0
PT	0.6	0.9
ST	0.5	0.5
UP	0.8	0.8
MV	0.5	0.7
ST	0.6	0.6
UV	0.6	0.6
SW	0.6	0.6
PC	0.7	0.7
NN	0.7	1.0
NV	0.4	0.4
IA	0.7	0.7

* Data from medical chart reviews after intervention.

APPENDIX 4

Step by step approach in empowerment dietary self-management process

Step One: Problem Identification
Some general guidelines for helping the client identify his/her problem* • Be curious and inquisitive. • Respect and accept the client's problem. • If there are many problems, ask which one the client considers to be the most important and easy to do first. • Act as facilitator and good listener
Examples of opened-ended questions to help the client define the problems** • "What is your biggest problem in achieving diet changes?" or • "What is the hardest thing about caring for your diet?" or • "What is your greatest concern?" • "Please tell me more about that." • "Are there some specific examples you can give me?"
Most common dietary problems from participants in this study • Eating in public places or eating out • Social gatherings • Enjoying leisure time
Some common reasons from participants excessively eating in this study • Difficulty resisting something that tastes good • Feeling of fatigue and weakness, especially rice, because of hard working • Seeing the favorite food on the surrounding areas • Social eating • Late evening eating • Feeling alone while watching TV at night • Difficulty ordering healthy meals because of being considerate from seller 's feeling • Eating provides comfort • Big portion of food • Between-meal snack • Smoking cessation • Worry/Stress
*, ** Adapted from Anderson (2000), Funnell(2004), and Adolfsson(2006).

Figure 4.9 Example of step one: problem identification approach

Step Two: Feelings Exploration

Some general guidelines for helping the client explore and express his/her feelings*

- Be silence for about 3-5 seconds to allow client time to reflect on a question or to recognize an insightful feeling.

Examples of opened-ended questions to help the client explore his/her feelings**

- "What are your thoughts about caring your diet, your weight, or your eating habit, including how do you feel about it?"
- "Could you tell a story about this situation?"
- "How do you feel about it?"

Most common answers from the clients in this study

At first visit

- "I would like to decrease my weight and I recognize the important to lose weight. I know everything. I tried several ways but they did not work. It's *boring* because the past attempts to follow a healthy meal plan haven't led to positive results, so I don't feel excited to try again. Sometime I followed my prescribed meal plan almost perfectly, and I even skipped dinner. So I woke up in the morning and my blood sugar was 300 mg/dl."
- "It's *hard to do always*. I have a big family. My children usually feed me with some desserts or some fruits that I like. Sometime I eat out very often with them on every weekend. Sometime I eat because of seeing it on the table rather than hungry. For example, perhaps I am trying to avoid ice cream, but there is a quart in the freezer for my grandchildren. "
- "Always eating healthy food is *boring and too deprived*. Cheating makes me happy."
- "In real life, there are too many temptations everywhere and *overwhelmed* by many surrounded personal, social, and environmental barriers, and it is *too hard to resist* them. It is *hard to say no*. Although I recognize the benefits of healthy eating. "

After intervention

- "It takes times and effort to better start with small changes than a big change. I feel good with learning in my quotas of food choices and make change under no pressure using trial and error step by step and learning from my experiments. Because either losing weight or desiring in good glycemic control is largely a matter of willpower."

Some common reasons from clients about not expressing his/her feelings***

- Do not familiar with the dietitian then they do not want to share their feelings. Usually occur at the first visit.
- Do not familiar with sharing their feelings with others. Do not have ideas to answers.
- Do not understand and not think their feelings relevant to dietary problem-solving.

*, ** Adapted from Anderson (2000), Funnell(2004), and Adolfsson(2006).
*** Data from informal discussion after completion the study.

Figure 4.10 Example of step two: feeling exploration approach

Step Three: Setting a long-term goal
Some general guidelines for helping the clients identify their long-term goal* • Begin by helping clients determine one or two high priorities that they wish to change • Move them to that direction. • Facilitate the success and promote the realistic goals.
Examples of opened-ended questions to help the client identify their long-term goal** • "What do you want from join this program?" • "Where would you like to be regarding this situation in (specific time, e.g., 1 month, 4 month, or a year?" • "What do you want to see the changes in this coming four months?" • "What are the barriers for you?" • "Who could help you?" • "Are you ready to make changes or ready to take action, including how important is it; on a scale of 1 to 10, for you to do something about this?" • "Let's develop a plan."
Most common long-term goals of the clients in this study • Requiring in good glycemic control. • Desiring in weight reduction but disappointment from the past experiences. • Desiring healthy living and free from long-term complications. • Not desiring to start any kinds of the oral hypoglycemic agents (OHA) or start insulin injection.
*, ** Adapted from Anderson (2000), Funnell(2004), and Adolfsson(2006).

Figure 4.11 Example of step three: Setting a long-term goal

Step Four: Plan making and commitment to action
Some general guidelines for helping the clients identify their plans* • Ask the client to list as many behaviors as he/she can think of that helping them to reach the long-term goal without pressure him/her viewpoint. • Ask the client to prioritize and choose some behaviors on the list to develop a plan. • Ask the client to make a feasible goal and easy to do when you leave here today. • Let the client think about "what to do", "how to do it", and "when to start".
Examples of questions to help the client identify their plans** • "What the success ways have you tried in the past?" • "What are you going to do and when are you going to do it?" • "What do you need to do to get start?" • "What is one thing you will do when you leave here today?"
Most common short-term goals of the clients in this study • ***Reduced carbohydrate intake as a goal*** - Reduced rice intake - Reduced fruit intake - Reduced sweet/desserts and late night snack - Reduced sweetened drinks • ***Reduced dietary fat intake as a goal*** - Reduced dietary fat and oil intake - Reduced desserts and snack foods • ***Increased dietary protein intake*** • ***Increased vegetables intake***
*, ** Adapted from Anderson (2000), Funnell(2004), and Adolfsson(2006).

Figure 4.12 Example of step four: Plan making and commitment to action

Step Five: Evaluation the outcomes
Some general guidelines for helping the client evaluate his/her results* • Encourage the client to think of their behavior change plan as a series of experiments. • Encourage the client to identify a goal and a behavioral step as a self-management experiment. • Ask the client to reflect on their experiments, evaluate what strategies did and did not work, and learn something from them. • Reassure the client concern in the realistic goals. • Ask the client to modify or continue his/her own goal setting. • Consistent with the collaborative problem-solving process. • Schedule his/her next appointment with the dietitian.
Examples of opened-ended questions to help the client evaluate the results** • "What did you learn and could you please tell me more about that?" • "What barriers did you encounter?" • "What would you do differently next time or what would you do the same?" • "What will you do when you leave here today?"
An experimental story from participants in this study • "In daily life, he tried to eat apple one portion with his goal setting and then monitored blood glucose by his meter, and found that 2-hour postprandial was 140 mg/dl, the over intake the higher blood glucose. On the next time, he tried ripped mango one portion then monitored blood glucose again, and he found that blood glucose was increased rapidly. Whenever he reduced the portion size, the blood glucose was going down. One month after intervention, he said he recognized in the relationship between food affected metabolic outcome and blood glucose. He worked with his wife to modify his favorite menus.**"**
*, ** Adapted from Anderson (2000), Funnell(2004), and Adolfsson(2006).

Figure 4.13 Example of step five: evaluation the outcomes

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