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The effectiveness of homeopathic food according to the Thai traditional medicine combined with the therapeutic lifestyle changes diet intervention in people with dyslipidemia

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Thai traditional medicine (TTM) has the homeopathic food suggestion focusing on food taste derived from local herbs and vegetables used as food ingredients to encourage the health condition of each of 4 main elements; earth, aqua, wind, and heat. Dyslipidemia is one of the huge public health problems in Thailand that can be relieved by medical nutrition therapy (MNT) based on the therapeutic lifestyle changes diet (TLC diet) guideline. This study aimed to integrate homeopathic food according to TTM and MNT based on the TLC diet in people with dyslipidemia. Totally 192 participants were recruited and further sampled into 4 main element groups. In each group, participants were sampled into 2 subgroups (24 in each intervention group and 24 in each controlled group). Participants in the intervention groups received MNT based on the TLC diet by the dietitian and intake of the provided homeopathic foods according to their main element for 12 weeks, while control group received MNT based on TLC diet only. Results revealed that participants in the intervention groups were significantly lower on triglyceride, low-density lipoprotein cholesterol (LDL-C), and total cholesterol than control group in almost all main element groups at the endpoint ($p<0.05$). In addition, participants in the intervention group of the wind element group were significantly higher on high-density lipoprotein cholesterol (HDL-c) than controlled group at endpoint ($p<0.05$). The findings from this study concluded that integration between homeopathic food according to TTM and MNT based on TLC diet intervention is effective to improve blood lipid profiles in people with dyslipidemia.

Keywords: Dyslipidemia, Food, Nutrition, Thai traditional medicine
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Thai traditional medicine (TTM) is an ancient health care methodology passed down from generation to generation among Thai people. This knowledge and implication ideas are influenced by Ayurvedic medicine, which is strongly tied to various Thai cultural and religious belief[1]. TTM concepts, like Ayurvedic medicine, are centered on therapy and rehabilitation focusing on herbal medication regimen and homeopathy to preserve optimum physiological activities[2]. In brief, TTM theory holds that the human body is made up of four elements: earth (all solidity in the body such as muscle, skin, and other internal organs), aqua (all fluidity in the body such as blood, body fluid, white blood cell, etc.), wind (all related mobility in the body such as blood circulation, food peristalsis, etc.), and heat (all related hormonal and enzymatic functions such as digestive enzymes, degenerative related enzymes, etc.)[3]. Furthermore, the TTM believes that people have their individual main element from the mentioned four elements as their main homeopathy characteristic, with each element requiring a different method of health care, particularly the taste of food consumed, to maintain the optimum functions of their main element. Briefly, the people with earth's main element are suggested food consumption focusing on astringent, sweet, oily, and salty tastes. Examples of food ingredients are such as beans, bananas, and guava. The people with the aqua main element have suggested a focus on a sour and bitter taste. Examples of food ingredients are such as neem, bitter gourd, and lime. The people with wind main element have suggested a focus on spicy taste. Examples of food ingredients are such as ginger, galangal, and pepper. The people with heat main element have suggested a focus on Bitter and tasteless. Examples of food ingredients are such as

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gourd, watermelon, and yam[4,5]. All recommended food tastes and ingredients are derived from botanical plants that Thai people use in their cuisine culture owing to the abundance in the local communities. According to previous studies, these plants are a rich source of phytochemical and natural chemical compounds that have strong antioxidant activity and contribute in decreasing blood lipid profiles[6].

Dyslipidemia is characterized by an imbalance of lipids such as total cholesterol (TC) above 200 mg/dL, low-density lipoprotein cholesterol (LDL-C) above 150 mg/dL, triglycerides (TG) above 150 mg/dL, and high-density lipoprotein cholesterol (HDL-C) below 40 mg/dL[7]. This problem, which can be caused by food, cigarette use, or genetics, can develop to cardiovascular disease with drastic consequences[8]. Recently, a continued rise in the incidence of dyslipidemias in both pediatrics and adulthood has been identified, which is likely linked to a higher overweight prevalence, which stimulates other cardiometabolic risk factors such as high blood pressure (BP), insulin resistance, and endothelial dysfunction[9]. All of these variables have a role in atherosclerosis, which is the major cause of mortality in adults in both developing and developed countries[10]. There is well known that overconsumption of high-fat and energy-dense food in long term is the major cause of dyslipidemia development. In Thailand, the high prevalence of adults with dyslipidemia was reported at 66%[11]. The Medical Nutrition Therapy (MNT) is defined as providing education and support to patients to assist them adopt a dietary pattern, and it plays a critical role in the prevention and management of these comorbidities, as well as the prevention of complications related to them, in people with dyslipidemia and other related-complications. Previous studies have confirmed the efficacy of MNT intervention based on Therapeutic Lifestyle Changes (TLC), the dietary pattern and lifestyle modification guidance aimed at improving blood lipid profile, lowering TC, LDL-c, TG, and increasing HDL-c in patients with various conditions and diseases[12,13]. According to the data on benefits of local Thai botanical plants commonly used in Thai traditional cuisine and dietary homeopathy suggestion based on TTM theory, as well the effectiveness of MNT based on TLC diet intervention on blood lipid profiles, the purpose of this study was to determine the efficacy of integrating the homeopathic method on diet for individual main elements according to the TTM with MTN intervention in people with dyslipidemia.

Methodology

Main element screening and background questionnaire

According to the TTM theory on individual main element identification, the personal main element is identified by the month of birth according to the Thai traditional calendar. In adjusting to the international calendar, people who are born in October to December are considered as being earth's main element, people who are born in July to September are considered as being aqua main element, people who are born in July to September are considered as being the aqua main element. People who are born in April to June are considered to be the wind main element, and people who are born in January to March are considered the heat main element[5]. Consequently, the self-respond questionnaire, adapted by the Institute of Thai Traditional Medicine, on the month of birth was developed to ask participants to identify their individual main element. In addition, this questionnaire included questions on sex, anthropometric data, and blood lipid profiles.

Dietary questionnaire

The 3-day food record, adapted from a previous study[14], was developed to collect data on participants' dietary habits before and after the study's endpoint. All participants were given knowledge of the Thai Food Exchange List and were instructed to count and estimate the portion of food consumed on 2 weekdays and one weekend day (both before the beginning and end of the study), which was then recorded into a questionnaire and sent to a dietitian for calorie and energy distribution calculations. Participants also self-evaluate their overall daily exercise time in order to monitor their physical activity improvement.

Homeopathic foods for each main element according to TTM preparation

The homeopathic foods menus for each individual main element were prepared and cooked based on the taste and ingredients suggested by TTM theory, with the energy, energy distribution, and other nutrient content modified in accordance with the TLC diet guideline. All food menus for each main element were made, under supervised by professionals in registered TTM, using local ingredients and traditional cooking methods commonly used in Thai households. Five menus of each main element were prepared to serve

as the lunch meal for participants in intervention groups on five weekdays (Monday through Friday), and participants in these groups were allocated to consume these provided meals based on their main element as lunch (only on weekdays) throughout the study. The energy distribution and nutrients content based on the TLD diet in each menu was calculated by the registered dietitian according to the guideline established elsewhere. Examples of food menus for the earth main element group were such as Young Jackfruit with Stir Fried Chili Paste, Curry banana blossom with pork, etc. The example of food menus for the aqua main element group was such as Pineapple Curry with Pork, Cassia Leaves Curry with Grilled Fish, etc. Examples of food menus for the wind main element group were such as Stir-fried Mixed Seafood with Basil and Chili, Stir Fried Chicken with Ginger, etc. Examples of food menus for the heat main element group were such as Thai Vegetable Stew, Vegetable Gourd Soup with Minced Pork and Tofu, etc (Table 1).

Participants in this study

After enrollment, a total of 192 participants were conveniently recruited in this study. The participants were allocated into 4 groups of each main element (earth, aqua, wind, and heat) according to their main element based on the main element identification questionnaire (48 for each group). Furthermore, each group was divided into 2 subgroups (24 for each group); the intervention group (participants to be received homeopathic food according to TTM combined with TLC diet intervention) and the controlled group (participants only received TLC diet intervention). The inclusion criteria included the Thai nationality with ages between 18-60 years, having any kind of abnormal blood lipid profile, and can participate throughout the study. The exclusion criteria included participants with a medical history of food allergy, receiving any lowering blood lipid medication or herbal products, receiving dietary supplements, and pregnant or breastfeeding women.

All study tools used in this study including questionnaires and detail of the ingredients and method of cooking were reviewed and proofread by the profession-registered TTM and professionals in registered dietitians before being submitted these revised study tools and protocol to the Burapha University-Institutional Review Board (BUU-IRB) for ethical approval (approval no. 186/2560).

Study procedure

The study procedure was performed at the Clinical Laboratory, Faculty of Allied Health Sciences, Burapha University, Chonburi province. After participants who met the study criteria were quota allocated into each main element group (by self-respond questionnaire) and signed the informed consent at the first meeting (week 0) in the provided room, they were evaluating their blood lipid profiles (CardioChek Home Use, PTS Diagnostics Cor, Indianapolis, IN), anthropometric assessment and body composition (resting metabolic rate, %body fluid, %body fat, and weight of muscle) using InBody270 (Cerritos Inc, CA, USA), and collected characteristics data, as well randomized them (by sampling) into subgroups of each main element (intervention and controlled group). In addition, all participants met the registered dietitian to give knowledge on the Thai Food Exchange List to instruct them how to estimate food portions and how to record the food consumed in the 3-day food record questionnaire. Last, participants were assigned to record the food consumed in the given questionnaire and made the appointment in the next 2 weeks.

In week 2, all participants were invited to the same provided room to receive MNT intervention based on the TLC diet by registered dietitians to educate, inspire, and encourage them to modify their dietary habits and lifestyle change. Participants in controlled groups were instructed and convinced to improve their dietary intake according to the TLC diet

Table 1 — Food menus based on the main elements used in this study

Earth main element	Aqua main element	Wind main element	Heat main element
Young Jackfruit with Stir Fried Chili Paste	Pineapple Curry with Pork	Stir-fried Mixed Seafood with Basil and Chili	Thai Vegetable Stew
Curry Banana Blossom with Pork	Cassia Leaves Curry with Grilled Fish	Stir Fried Chicken with Ginger	Vegetable Gourd Soup with Minced Pork and Tofu
Stir-fried Pumpkin with Eggs	Hot and Sour Katuri Flower Soup	Stir-fried Spicy Catfish	Stir-fried Zucchini with Eggs
Prawn and Paco Leaves Salad	Northeastern Thai Beef Curry	Fried Chilly Paste with Pork	Stuffed Bitter Gourd in Clear Soup
Bake Rice and Cereal with Shrimp	Thai Sweet & Sour Sauce Fried with Pork	Thai Spicy Mixed Vegetable Soup with Prawns	Stir fried Chayote with Oyster Sauce

guideline to promote their optimum blood lipid profiles as well as increase physical activity in daily life. The participants in controlled groups further met the dietitians every 2 weeks in weeks 4, 6, 8, and 12 to monitor and encourage them to keep their dietary habits and lifestyle modification according to the suggestion. For intervention groups, participants received the MNT intervention based on the TLC diet same as the participants in controlled groups. Additionally, participants in intervention groups were further made an appointment (in the same room) to intake the prepared homeopathic food according to TTM based on their main element at lunchtime. The participants were invited every weekday to intake the daily scheduled homeopathic food menus (5 menus a week) unstill the end of the study at week 12. Moreover, participants in intervention groups also met the dietitians every 2 weeks (weeks 4, 6, 8, and 12) similar to the controlled groups to encourage and promote them to modify their dietary habits and lifestyle. Finally, all participants collected data on blood lipid profiles and anthropometric data again at end of the week 12 intervention. Also, participants were given the 3-day food record questionnaire to record their dietary habits at end of week 12 and submit to the dietitian in the next week.

Statistical analyses

The age, anthropometric data, resting metabolic rate (RMR), body compositions, blood lipid profiles (TC, TG, HDL-c, and LDL-c), length of daily exercise, and energy distribution consumed of all participants were given as mean ± standard deviation (SD). To examine the differences in these means between participants in the controlled and intervention groups, the independent paired t-test was applied. The dependent paired t-test was used to compare the difference within group between baseline and endpoint. At the same time, Pearson-Chi square was used to compare the % sex and occupation differences between groups. Statistical analyses were carried out using Predictive Analytical Software Statistics (PASW) 21. (SPSS Inc, Chicago, Il). The significant difference was deemed at $p<0.05$.

Result

The average age of participants in each group ranged from 22.25-24.12 years and there was no significant difference in the age of participants between subgroups in all main element groups (data not shown in table). The results on sex, anthropometric data, body compositions, blood lipid profiles, and daily exercise habits of participants in the earth main element group were presented (Table 2). There was no significant difference in anthropometric data and blood lipid

Table 2 — Results on anthropometric data, blood lipid profiles, and length of daily exercise of participants in earth main element group

Variables	Baseline		p value	Endpoint		p value
	Intervention n=24	Controlled n=24		Intervention n=24	Controlled n=24	
Sex						
Male, n (%)	15 (62.00)	16 (66.00)	0.76[a]	15 (62.00)	16 (66.00)	0.76[a]
Female, n (%)	9 (38.00)	8 (34.00)		9 (38.00)	8 (34.00)	
BMI, mean (SD)	24.20 (1.50)	23.16 (2.20)	0.06[b]	23.04 (1.08)	23.54 (1.61)	0.21[b]
RMR (kcal), mean (SD)	1885.00 (119.84)	1950.33 (137.25)	0.08[b]	1877.95 (158.52)	1919.62 (170.46)	0.38[b]
%Body fluid, mean (SD)	56.91 (5.43)	55.91 (2.81)	0.42[b]	56.58 (3.92)	55.75 (2.93)	0.40
%Body fat, mean (SD)	35.04 (2.11)	34.29 (1.85)	0.19[b]	31.29^ (3.02)	33.20 (2.76)	0.02*[b]
Weight of body muscle (kg), mean (SD)	42.62 (8.48)	40.79 (7.10)	0.42[b]	44.33 (5.54)	42.91 (5.65)	0.38[b]
TG level (mg/dL), mean (SD)	156.04 (5.31)	158.41 (4.69)	0.10[b]	144.83^ (7.60)	155.70 (5.87)	<0.00*[b]
HDL-c (mg/dL), mean (SD)	53.16 (2.59)	52.91 (2.43)	0.73[b]	53.33 (4.28)	52.37 (2.10)	0.33[b]
LDL-c (mg/dL), mean (SD)	149.62 (7.98)	153.25 (8.66)	0.13[b]	142.33 (9.55)	150.08 (10.77)	<0.05*[b]
TC (mg/dL), mean (SD)	202.79 (8.53)	206.16 (8.14)	0.16[b]	195.66 (8.51)	202.45 (10.99)	<0.05*[b]

[a]Pearson Chi-Square
[b]Independent paired t-test
^Significant difference within group ($p<0.05$)
*Significant difference between groups ($p<0.05$)

profiles between the 2 groups at an endpoint. Except for the TG, LDL-c, and TC participants in the intervention group were significantly lower than the controlled group at endpoint ($p<0.05$). In addition, the participants in intervention group were significant decreased their %body fat and TG level at endpoint when compared with baseline ($p<0.05$).

For participants in the aqua group, results revealed that there was no significant difference in sex between the controlled group and intervention group. There was no significant difference in participants' blood lipid profiles at the endpoint, except LDL-c which participants in the intervention group were significantly lower than the controlled group at the endpoint ($p<0.05$) (Table 3). In addition, the participants in the intervention group significant decreased their TG and LDL-c after the end of the study ($p<0.05$).

For participants in the wind main element group, there was no significant difference in sex between the intervention group and controlled group, as well as the BMI, TG level, and TC level. However, the intervention group found they significantly lower the LDL-c and resting metabolic rate than controlled group ($p<0.05$). The results indicated participants in the intervention group were found significantly higher than the controlled group on HDL-c at the endpoint ($p<0.05$) (Table 4). Moreover, participants in the intervention group were found the significantly decreased their RMR at the endpoint ($p<0.05$).

The results of participants in the heat main element group found that there was no significant difference in sex, BMI, and blood lipid profiles between the intervention group and controlled group. Except for the LDL-c, the results indicated participants in the intervention group were significantly lower than the controlled group ($p<0.05$) (Table 5). Moreover, participants in the intervention group were found the significantly decreased their TG level and LDL-c at the endpoint ($p<0.05$).

The results on the dietary habits and lifestyle modification found that all participants in the intervention groups of all main elements were significantly lower in percent energy distribution from fat when compared with the controlled groups. However, in all subgroups were found the amount of sodium consumed ranged from 2,500-3,200 mg per day. In addition, only participants in the intervention group of earth main element had a significantly higher length of daily exercise at the endpoint ($p<0.05$) (data not shown in table).

Table 3 — Results on anthropometric data, blood lipid profiles, and length of daily exercise of participants in aqua main element group

Variables	Baseline		p value	Endpoint		p value
	Intervention n=24	Controlled n=24		Intervention n=24	Controlled n=24	
Sex						
Male, n (%)	12 (50)	14 (58)	0.33[a]	12 (50)	14 (58)	0.33[a]
Female, n (%)	12 (50)	10 (42)		12 (50)	10 (42)	
BMI, mean (SD)	23.50 (2.04)	23.20 (1.61)	0.51[b]	22.79 (1.93)	22.91 (1.50)	0.38[b]
RMR (kcal), mean (SD)	1879.83 (131.16)	1887.45 (91.03)	0.20[b]	1829.20 (149.35)	1871.95 (95.50)	0.05[b]
%Body fluid, mean (SD)	56.75 (5.81)	56.37 (3.84)	0.79[b]	57.20 (3.79)	57.95 (7.94)	0.67[b]
%Body fat, mean (SD)	34.08 (1.76)	33.41 (3.30)	0.38[b]	32.75 (2.78)	34.12 (2.11)	0.06[b]
Weight of body muscle (kg), mean (SD)	41.58 (6.07)	39.79 (7.14)	0.35[b]	42.29 (4.84)	40.70 (6.89)	0.36[b]
TG level (mg/dL), mean (SD)	155.79 (5.04)	156.54 (4.27)	0.26[b]	146.33^ (7.48)	155.29 (8.32)	0.24[b]
HDL-c (mg/dL), mean (SD)	51.04 (3.18)	51.20 (2.88)	0.81[b]	54.41 (2.39)	52.25 (2.26)	0.55[b]
LDL-c (mg/dL), mean (SD)	153.95 (9.06)	151.50 (7.47)	0.12[b]	144.66^ (10.39)	149.41 (8.09)	0.04*[b]
TC (mg/dL), mean (SD)	205.00 (8.67)	202.70 (7.89)	0.48[b]	199.08 (10.89)	201.66 (8.45)	0.06[b]

[a]Pearson Chi-Square
[b]Independent paired t-test
^Significant difference within group ($p<0.05$)
*Significant difference between groups ($p<0.05$)

Table 4 — Results on anthropometric data, blood lipid profiles, and length of daily exercise of participants in wind main element group

Variables	Baseline		p value	Endpoint		p value
	Intervention n=24	Controlled n=24		Intervention n=24	Controlled n=24	
Sex						
Male, n (%)	14 (58)	15 (62)	0.76[a]	14 (58)	15 (62)	0.76[a]
Female, n (%)	10 (42)	9 (38)		10 (42)	9 (38)	
BMI, mean (SD)	23.04 (0.95)	23.29 (1.68)	<0.00*[b]	22.00 (1.56)	23.08 (1.90)	0.29[b]
RMR (kcal), mean (SD)	1911.62 (128.69)	1938.70 (148.44)	0.47[b]	1805.91^ (111.07)	1908.91 (195.58)	0.02*[b]
%Body fluid, mean (SD)	55.08 (3.78)	56.91 (3.48)	0.08[b]	55.70 (3.49)	56.70 (4.16)	0.37[b]
%Body fat, mean (SD)	33.08 (2.14)	32.04 (2.40)	0.12[b]	33.54 (1.88)	32.66 (3.19)	0.25
Weight of body muscle (kg), mean (SD)	43.16 (6.02)	42.08 (6.64)	0.55[b]	43.62 (6.55)	43.37 (6.95)	0.89[b]
TG level (mg/dL), mean (SD)	155.79 (4.87)	157.58 (3.11)	<0.00*[b]	147.12 (8.56)	160.50 (6.96)	0.23
HDL-c (mg/dL), mean (SD)	51.91 (3.86)	52.25 (3.28)	0.78[b]	57.45 (1.31)	53.33 (3.15)	<0.00*[b]
LDL-c (mg/dL), mean (SD)	153.41 (6.55)	151.91 (6.53)	0.87[b]	145.33 (10.55)	149.37 (7.34)	0.04*[b]
TC (mg/dL), mean (SD)	205.33 (6.64)	204.16 (7.02)	0.83[b]	202.79 (10.64)	202.70 (8.36)	0.23[b]

[a]Pearson Chi-Square
[b]Independent paired t-test
^Significant difference within group ($p<0.05$)
*Significant difference between groups ($p<0.05$)

Table 5 — Results on anthropometric data, blood lipid profiles, and length of daily exercise of participants in heat main element group

Variables	Baseline		p value	Endpoint		p value
	Intervention n=24	Controlled n=24		Intervention n=24	Controlled n=24	
Sex						
Male, n (%)	15 (62.00)	16 (66.00)	0.76[a]	15 (62.00)	16 (66.00)	0.76[a]
Female, n (%)	9 (38.00)	8 (34.00)		9 (38.00)	8 (34.00)	
BMI, mean (SD)	24.04 (1.51)	23.95 (1.62)	0.74[b]	23.41 (1.58)	23.70 (2.34)	0.08[b]
RMR (kcal), mean (SD)	1932.12 (152.16)	2017.79 (262.79)	0.29[b]	1921.04 (156.90)	1856.58^ (125.98)	0.12[b]
%Body fluid, mean (SD)	56.66 (3.65)	57.45 (3.56)	0.45[b]	57.04 (4.75)	57.70 (4.82)	0.63[b]
%Body fat, mean (SD)	32.91 (3.07)	33.95 (2.07)	0.17[b]	32.08 (2.7)	33.04 (3.27)	0.28[b]
Weight of body muscle (kg), mean (SD)	41.83 (7.25)	42.91 (7.06)	0.60[b]	42.54 (5.25)	42.83 (5.46)	0.85[b]
TG level (mg/dL), mean (SD)	158.08 (5.40)	156.50 (4.58)	0.44[b]	146.79^ (8.52)	148.08^ (10.26)	0.39[b]
HDL-c (mg/dL), mean (SD)	51.41 (3.29)	52.12 (2.84)	0.32[b]	53.37 (3.34)	53.16 (3.30)	0.66[b]
LDL-c (mg/dL), mean (SD)	149.83 (7.08)	152.04 (8.52)	0.36[b]	139.12^ (5.18)	148.50 (11.85)	<0.00*[b]
TC (mg/dL), mean (SD)	201.25 (7.57)	204.16 (8.33)	0.90[b]	192.50 (6.29)	201.66 (12.54)	0.06[b]

[a]Pearson Chi-Square
[b]Independent paired t-test
^Significant difference within group ($p<0.05$)
*Significant difference between groups ($p<0.05$)

Discussion

Recently, the healthcare processes using TTM has gained popularity in hospital and health service centers in Thailand because the government's policy and the number of scientific pieces of evidence on the knowledge and effectiveness of TTM has increased[15]. However, there are abundantly accumulated knowledge on ethnobotanical and herbal plants used in the Thai traditional pharmacy due to their diversity of herbal plants and rich in phytochemicals related to pharmacokinetics[16,17]. This is the first clinical trial study that investigated the effectiveness of homeopathic foods according to the TTM which is the principle of ancient nutrition suggestion based on TTM that is usually promoted to the general Thai population by professionals in registered TTM but never existed scientific evidence-based. This study focused on people with dyslipidemia which is one of the public health problems in Thailand and the results established the effectiveness of the homeopathic food according to TTM combined with TLC diet intervention in lowering the harmful blood lipids in all main element groups. The participants in the intervention group were a greater decrease in LDL-c and TG at end of the study than the control group which supported the findings of previous studies using TLC diet combined with food supplements to lower blood lipids of participants[18,19]. The nutrients and energy in foods consumed could be played a key role in these findings. The provided homeopathic foods by the professionals in TTM and dietitians were low in energy from saturated fatty acid and abundant in dietary fiber which could help in lowering the blood lipid reported by the previous study[20]. In addition, the results could be explained by that the provided homeopathic according to TTM were composed of vegetables which are great sources of phytochemicals, the natural compounds potential to improve blood lipid profiles[21]. For the body compositions, the participants in the intervention group of the earth main element only decreased their %body fat after the end of the study. This is possible that they are the only group that significantly increased their length of daily exercise, whereas other groups cannot improve their physical activity habits. The benefits of exercise are established by the previous study to improve the %body fat[22], increase body muscle[23], and improve the blood lipid profiles[24]. Therefore, future study is needed to focus on increasing the physical activity among participants for more effectiveness of the intervention using these homeopathic foods according to TTM combined with the TLC diet intervention.

The daily sodium intake of participants in all groups was reported as exceeding the suggestion that limited 2,300 mg per day[25]. The findings supported the previous study on the overconsumption of sodium among Thai people (3600 mg per day)[26] which is one of the nutritional problems that should be focused on by dietitians and professionals in health care to minimize sodium intake among the population to lower the risk of chronic kidney disease and hypertension[27]. One of the factors that affected people's dietary habits and lifestyle modification is the individual stage of change[28]. Although participants in the intervention groups improved their blood lipid profiles that could be because of provided dietary intervention, their stage of change on increasing the exercise seemed to be in the contemplation stage. This could be the reason that why their length of daily exercise not be improved and their %body fat was not decreased. Last, homeopathic foods according to TTM suggested the taste of foods for each main element should be considered based on the personal health condition of people. For example, people being the wind main element should avoid spicy foods if they are suffering from gastric ulcers[29], people with chronic kidney disease have to restrict their sodium, potassium, and phosphorus intake whatever the main element they are and whatever the homeotic food taste suggestion[30]. Hence, homeotic food according to TTM's suggestion should be based on the nutritional sciences as well. The limitation of this study was dietary habits of participants after the end of the intervention are not followed up. The future study is suggested to monitor the participants' dietary habits and their blood lipid profiles outcome as the cohort to explore the effectiveness of intervention in long term.

Conclusion

The findings of this study reported on the effectiveness of the integration between the homeopathic food intake and MNT based on the TLC diet intervention. Although the blood lipid profiles of participants in all groups did not reach the optimum criteria due to the limitation on the short intervention of this study, the participants in intervention groups were found significantly improve their blood lipid profiles when compared with the controlled groups at the endpoint. In conclusion, homeopathic foods

according to the TTM combined with TLC diet intervention are effective to improve blood lipid profiles in people with dyslipidemia.

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Conflict of Interest

Authors declare they do not have any conflict of interest.

Author Contributions

AS obtained the funding acquisition. AS, UB, and NR carried out the study intervention. SK performed statistical analyses. AS and SK wrote the manuscript with proofread from UB and NR. All authors read and approved the final manuscript.

Ethical Approval

This study was approved by the Burapha University-Institutional Review Board (BUU-IRB) for ethical approval (approval no. 186/2560).

Informed Consent

Informed consent was obtained from the participants who participated in the study.

Data Availability

The data are exclusively retained by the authors.

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