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HEALTH PROMOTION IN NATIVE NORTHEASTERN THAI ELDERLY FEMALES USING GINGER INGESTION AS AN INTERVENTION

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Abstract

Objective: To evaluate the efficacy of health promotion in native elderly females in Northeastern Thailand by using ginger intake as an intervention. Changes in health-related behavior, basic physical fitness, levels of blood glucose, and lipid profiles are used as indicators. **Materials and Methods:** A class of health-related education, including health knowledge, services, communication, media, information, and self-care decisions, was conducted for the native northeastern elderly females of Thailand. Thirty-three elder females, from a Local Health Promotion Hospital (LHPH), voluntarily participated. They were initially tested for basic physical fitness parameters and blood samples. Subjects were then randomly classified as control (C, n = 17) and experimental (E, n =16) groups for a 30-day intervention duration. Initially, both groups were assigned to join a home-based physical activity and health education class. Only the experimental group received ginger powder, 75mg/kg BW/day after breakfast. All subjects were carefully instructed to keep their normal dietary patterns and home-based physical activity during the period of this study. Basic physical fitness parameters, blood samples and health-related behavior questionnaire were collected on the first day after the 30-day intervention. **Results:** Following the 30-day intervention, only E group showed improvement in health-related knowledge ($p<0.05$) and self-care decisions ($p<0.05$) whereas other health-related behaviors remain unchanged. Moreover, the significant reduction in plasma triglycerides (TG; 197.00±80.38 and 146.06±74.67 of Day0 and Day 30, respectively) but not on other lipid and glucose levels, and physical fitness parameters. **Conclusion:** Health-related instruction could promote better self-care knowledge and behaviors while ginger might possibly be used as one of the strategic health promotion tool by its blood triglycerides lowering effect.

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1. Introduction

To cope with the global burden of non-communicable diseases (NCD), healthcare systems need to be shifted to promotion and prevention [1]. As Thailand is becoming an ageing society, there are increasing demands on social and governmental supports [2]. Like other countries, Thailand's public health policies are facing to barriers to overcome [3]. Some parts of Thailand, in particular the Northeast, need special strategies to establish behavioral changes, social learning, and community health promotion [4]. The fast-growing number of NCD patients is particularly prevalent among individuals in the Thai population with lower educational attainment, therefore, this difficulty has to be overcome [5]. In Northeastern part of Thailand, elder females play critical roles in managing for daily needs, meals, household chores and well-being of all family members [6]. Females' perception, however, might play a critical role to induce community health benefits [7]. With the traditional beliefs, most people from the Northeastern part of Thailand remain in their old lifestyle of daily living despite the fact that various health promotion strategies were intervened [2, 4]. It is a big challenge to find out a handy tool for health promotion.

The effectiveness of ginger (*Zingiber officinale* Roscoe, Zingiberaceae) ingestion is widely reported as the alternative treatment to subside symptoms of indigestion, nausea and vomiting, joints and muscle pain, cold, and asthma, anti-hyperlipidemia, anti-obesity, anti-inflammatory and anti-cancer effects, anti-hypertension, anti-oxidative stress, antifungal infection, and on osteoarthritis, and diabetes [8-11]. Since, ginger is one of the most commonly consumed dietary condiments with less complication [12, 13]. We hypothesized that ginger can be used as an intervention for health promotion in the northeastern elderly females of Thailand. Thus, the objective of this study was to evaluate the effectiveness of health promotion, using ginger ingestion as a tool, in elder females. Outcomes on blood sugar, lipid profiles and physical fitness are carefully evaluated.

2. Materials and Methods

2.1 Participants

Elderly females, from a Local Health Promotion Hospital (LHPH), voluntarily participated with the present study. Inclusion criteria included: a) living in Nong Kai province, Thailand, over half of their lives, b) ages between 60-69 years, c) apparently healthy without serious cardiorespiratory and musculoskeletal diseases, and d) able to join throughout 30 days of the study. After explanation on benefits and risks of the study, informed consent forms were completed prior to the test. Vital signs and physical examination were estimated. This study protocol was approved by Khon Kaen University Ethics Committee for Human Research (HE602231).

2.2 Study design

This is a randomized controlled trial, using a parallel-group design, for 30 days. Interventions included: a) health education class (health knowledge, access to health services, health communication, health media and information and decision for self-care) and b) 30 days with ginger ingestion. After a routine home-

based exercise class, subjects were randomly divided into 2 groups: control (C) and experimental (E) groups. Only E group received ginger powder at a dose of 75mg/kg BW/day dissolved with water once a day after breakfast for 30 days [14]. All subjects in both groups were instructed to keep routine home-based exercises on top of activities of daily living and dietary patterns and avoid ginger ingredient in their meals during the period of this study. Figure 1 presents the flow diagram of this study.

2.3 Measurement and data collection

All data were collected on-sites, at the LHPH, prior to (Day 0) and after (Day 30) of intervention. Vital signs, heart rate, systolic blood pressure and diastolic blood pressure, were achieved using digital sphygmomanometers (Omron HEM-7121, Japan) in the sitting position. Outcomes of health education and physical fitness for both groups were conducted using a specific questionnaire and field-based testing items of subcutaneous fat (skinfold caliper; Lange®, USA), hand grip and leg strength (handgrip and leg dynamometers; Takei, Japan), flexibility (sit and reach test; sit and reach test box, Baseline®, USA), and cardiovascular endurance (6 min-walk distance). Hand grip and leg strength and flexibility were tested twice in which the averaged values were used.

Blood analysis was done at the laboratory, where subjects arrived at 9 am on day 0 and day 30. Blood samples of 10 ml each were taken from the antecubital vein. After centrifugation at 3000 rpm for 15 minutes at 4°C, the plasma aliquot was stored at -80 °C for further analysis of triglycerides (TG), cholesterol (Chol), high-density lipoprotein (HDL), low-density lipoprotein (LDL), and glucose using an automatic chemistry analyzer (Cobas® C501, Roche Diagnostics Ltd., Switzerland).

2.4 Statistical analysis

The SPSS program was used for statistical analysis (version 16, IBM, New York, USA). After the normal distribution testing by Kolmogorov Smirnov test ($p>0.05$), results of general characteristics between groups were compared using independent t-tests. Changes in blood chemical profiles and physical fitness levels were analyzed using two-way ANOVA with Bonferroni *post hoc* test. Statistical significance was accepted when $p<0.05$.

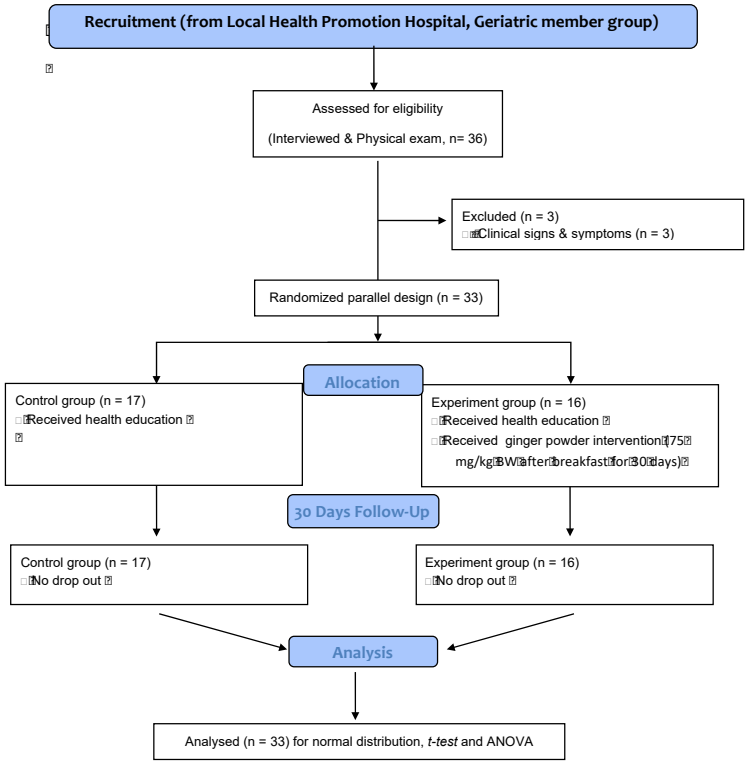

Figure 1. Flow diagram of this study.

3. Results

Thirty-six subjects initially participated but three subjects were excluded from the experiment because of unsteady resting heart rates and other unknown nausea symptoms. The characteristics of subjects in each group (Table 1) showed no significant differences in age, body weight, height, body mass index (BMI), and resting heart rate ($p>0.05$). Both groups show the borderlines of slightly high of systolic blood pressures (SBP). All of the above resting variables showed no significant differences of either on Day 0 (Table 1) or Day 30 (data not shown) of intervention ($p>0.05$).

Table 1. Characteristics of all participants on Day 0 (n =33). Values are means and standard deviations.

	Control group (n = 17)	Experimental group (n = 16)
Age (years)	64.00 ±6.5	65.00 ±4.6
Body weight (kg)	58.06 ±8.4	60.83 ±9.5
Height (cm)	152.90 ±5.9	153.2 ±6.5
Heart rate (bpm)	80.83 ±21.1	83.28 ±6.2
BMI ($kg.m^{-2}$)	24.84 ±3.5	25.92 ±3.6
SBP/DBP (mmHg)	144 ±22.6/73.3 ±10.5	138.3 ±16.4/71.0 ±16.3

Data were presented as mean± standard deviation (SD). BMI: body mass index; SBP: systolic blood pressure; DBP: diastolic blood pressure

Table 2. Averaged scores of 5 health-related behavior of all participants in two groups before (Day 0) and after (Day 30) a class of education.

Components	Day 0	Day 30
Health knowledge	3.53±0.28	4.04±0.12*
Ability to access to health services	3.92±0.12	3.56±0.59
Ability on health communication	4.09±0.23	4.15±0.48
Choosing media and information	4.39±0.42	4.49±0.73
Decision for self-care	1.62±0.05	3.54±0.11*

Data were presented as mean± standard deviation (SD). * significant difference ($p<0.05$) between before and after education.

The outcomes from health education achieved from the older Northeastern population before and after 30-day intervention. Results show improvements in health knowledge ($p>0.05$) and decision for self-care ($p>0.05$), while other components remained unchanged.

Table 3. Physical fitness of two groups before (Day 0) and after (Day 30) treated with ginger ingestions. Values are means and standard deviations.

Components	Control group (n = 17)		Experimental group (n = 16)	
	Day 0	Day 30	Day 0	Day 30
Subcutaneous fat (mm)	24.61 ±3.26	24.22 ±4.16	26.44 ±6.02	25.43 ±4.61
Hand strength (kg)	14.64 ±3.11	15.24 ±2.63	17.56 ±6.41	16.97 ±3.22
Leg muscle strength (kg)	10.61 ±2.50	12.87 ±3.67	10.89 ±2.32	13..28 ±3.84
Flexibility (cm)	6.17 ±1.12	8.69 ±2.35	4.61 ±1.25	5.39 ±2.43
6-min Walk Distance (m)	265.28 ±39.63	269 ±21.14	279.58 ±30.87	285 ±16.52

Data were presented as mean± standard deviation (SD).

Field-based physical fitness testing was conducted on site at LHPH. Thus, the fitness components were manually performed. Data was compared for both within- (Day 0-Day 30) and between-groups (Table 3). Results show that all parameters including subcutaneous fat, hand and leg muscle strength, flexibility, and cardiovascular endurance were different for neither within nor between groups ($p>0.05$)

Table 4. Plasma glucose and lipid profiles before (Day 0) and after (Day 30) treated with ginger. Values are means and standard deviations.

Parameters	Control group (n = 17)		Experimental group (n = 16)	
	Day 0	Day 30	Day 0	Day 30
Glucose (mg/dl)	115.06 ±25.97	112.78 ±46.93	145.50±69.13	118.56±58.13
Cholesterol (mg/dl)	162.44 ±28.98	166.17 ±53.77	193.17±30.76*	181.72±72.97
Triglycerides (mg/dl)	82.44 ±22.81	92.67 ±40.27	197.00±80.38*	146.06±74.67#
HDL (mg/dl)	65.89 ±10.70	60.89 ±20.43	60.39±17.00	55.72±21.92
LDL (mg/dl)	80.11 ±24.62	86.83 ±36.39	90.44±29.65	96.67±46.98

Data were presented as mean± standard deviation (SD). HDL: high-density lipoprotein; LDL: low-density lipoprotein.

* significant ($p<0.05$) difference between control and experimental groups,

significant ($p<0.05$) difference within the same group on day 0 and 30.

Pre-intervention blood concentrations (day 0) showed that the control group had significant lower levels cholesterol and triglycerides (TG) than the experimental group (Table 4). Comparisons between pre- and post-intervention of the same group revealed that blood glucose levels were unchanged in both groups. With pre- and post-intervention comparison, blood TG were statistically ($p<0.05$) reduced in the experimental group but not in the control group. Other blood lipid profiles remained unchanged after 30 days for both groups ($p>0.05$).

4. Discussion

Many health promotion strategies had been established in order to solve NCD in Thailand including specific classes and other field interventions [4]. Previous studies reported the anti-hyperlipidemia and anti-hyperglycemia effects of ginger but at higher dose of 3 g/day [15]. The present study found the possibility that ginger, at a lower dose, can be utilized for health promotion in ageing females in the northeastern part of Thailand. However, the results in this study showed the change in single blood lipids-related outcome, the triglycerides (TG). The effectiveness of ginger ingestion appears only in those elderly females with high blood TG. While the efficacy of health education could promote the health knowledge on self-care and decision-making. At the beginning, subjects in E group showed tendencies of higher levels of all blood lipids. This was later found by investigators that those who had underlying clinical problems. Another limitation was that subjects lived closely in the same area, thus we could not blind them from self-testing on small packs of powder provided. From our trials, this was true no matter it was packed in a solution or capsule forms. Taste and scent of aroma substances remain a problem for supplement investigation.

These outcomes are controversy from previous studies which might be because of the intervened dosage and duration. Hyperlipidemia was ameliorated after 45 days of receiving ginger capsules 3 g/day [15]. Another study in type 2 diabetic patients similarly revealed anti-hyperglycemia and anti-hyperlipidemia after 8 weeks of daily 3-g ginger consumption. In general, ginger has been found to indicate a beneficial effect on high dosage and long-term treatment in metabolic diseases[16]. For example, daily administration of 3 g of ginger in type 2 diabetic patients for 6 months showed the significant reduction in level of blood insulin, TG, LDL-C, and insulin resistance, but it had no significant effect on total cholesterol and HDL levels [17]. Another study in patients with coronary artery diseases, taking 4 g of ginger for 3 months caused no significant changes in blood lipids [18]. The efficacy of ginger in decreasing TG may be related to an increase of lipoprotein lipase enzyme activity and therefore hydrolysis and reducing serum triglycerides [19]. Moreover, ginger also diminishes the carbohydrate-responsive element-binding protein (ChREBP) gene expression, a transcriptional regulator of lipid and glucose metabolism, converts excess carbohydrates into triglycerides, in the liver [20].

This study used a 5-point Likert scale to evaluate 5 areas of education implanted. Health knowledge and the decision for self-care considerably reflect the subjects' internal ability to cope with and judge their own problems, whereas the remaining variables, likely, represent external factors impacted [21]. At least, this study brings about a method of improving self-care among the older Northeastern population.

General characteristics and physical fitness showed statistical differences of either within and between group comparisons. Borderline high blood pressures in this study are among the major age-related problems found in the countryside of Thailand [22]. One recent study revealed the averaged high SBP and DBP of 199.8 and 109.8 mmHg respectively [23]. Despite the fact that hypertension being a common health problem among the elderly in Northeastern Thailand, only 13.2 percent adhered to medical treatment [24].

Our findings in hand grip strength (HGS) are in good agreement with data of Asean females at the same age, in which HGS was 18.58(4.78), 15.83(4.14), and 18.01(4.82) kg in Chinese, Malaysian, and Indian respectively [25]. It is documented that the existing age-related degenerative changes significantly affect muscle strength, joints, tendon, bone, nerve and receptors, blood supply, skin, and fingernails and finally associate with postural imbalance and slow mobility [26]. The walking distance (6 min walk test) in this study is slightly low when compared to other studies [27]. This may be due to the limited space within the LHPH. It is generally accepted that a distance needed for 6-min walk should be about 30 m in a straight hallway [28]. As the above set up cannot be done, deviation of walking distance may be derived. This is indicated by a study which conducted in a 10-m distance where walking speed diminished to less than 0.8 m/sec [29]. The other error may be dependent on whether subjects' walking speed is self-paced or under encouragement. A study indicated that walking speeds during 6-Minute Walk Test ranged from 0.73–1.67 (comfortable speed) to 0.82–2.15 m/sec (fast speed) [27]. These variations should be considered for future investigations.

With the subjects' highest education levels of grade 6, the strategy implanted for health promotion should be considerably conducted in a very simple way. A dietary condiment, ginger is then chosen. With collaboration from the staffs of a Nong Kai LHPH, this study adhered toward 30-day procedure quite properly. The most important finding of this short-term intervention is that ginger supplementation significantly reduced a blood lipid profile of triglycerides. The present study used a dissolved form of ginger powder. A previous study used steamed ginger supplementation, which remarkably exhibited reductions in plasma total cholesterol and triglycerides [30]. Another previous study showed that ginger can be considered as an effective treatment in the prevention of diabetic complications [31]. Unlikely, the present study did not show a reduction of plasma glucose. Taken together, however, oral consumption of ginger might be useful for treatment of some lipids abnormalities, TG in particular.

5. Conclusion

Apart from changes in knowledge and better self-care among older females in the Northeast of Thailand, a model of dietary condiments, ginger, is possibly used as a tool for health promotion. However, a clear health benefit is narrowed just in the reduction of TG blood lipids. Clearer results are expected with more subjects and extension of the intervention period and higher dose of ginger. Further investigations also include other dietary condiments and more intense home-based physical activity.

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