令和 2 年度　学位論文

インドネシアの女性と学童の
エネルギー摂取調節に関する研究

Dietary Strategy to Control Energy Intake in Indonesian Women and School Children

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Abstract

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Background: Indonesia has been experiencing lifestyle-related diseases, mainly caused by overweight problems which might be due to a shift to unhealthy dietary habits as part of the consequences of economic development and lifestyle changes. Previous findings at the master level showed higher intakes of energy and lipids, especially from palm oil, in women and school children who were suffering from overweight and obesity. These intakes could be controlled by adopting healthier dietary habits with the hope of reducing lifestyle-related disease risks; this leads to the consideration of new, better dietary strategies for women and school children. Therefore, two studies were conducted, one in women and one in children. For women, considering the difficulty of reducing palm oil intake in the Indonesian diet due to eating habits and food patterns, the focus was on higher intake of vegetables, expecting a decrease in energy intake. For children, the effects of introducing a school meal program on their dietary behavior were studied. Elementary school in Indonesia starts at 6:30 am and ends in the late afternoon with two breaks (8-9 am, 11-12 am). Since there is no school meal program in Indonesia and this leads children to satisfy their hunger with fast foods from street vendors around their school, we studied whether school meals could help modify and improve children`s lifestyle.

Purpose: To evaluate the dietary strategies to control energy and lipids intakes, for women by consuming more vegetables daily and for children by implementing a school lunch program during the school week.

Methods: There were two studies conducted at the doctoral level: one on women (Study A) and the other on children (Study B).

Study A: The women' s study focused on the effects of consuming vegetables for 21 days consecutively on energy and blood biochemical variables. In a parallel study, 30 pairs of women were match-paired for overweight, menopause, hyperlipidemia, age, etc., and divided randomly into two groups (a vegetable group and a control group). The amount of 400g vegetables was given daily to the vegetable group during a treatment period of 21 days. A

one-week cycle that consisted of 7 vegetable menus was developed. Anthropometric measurements, a nutrition survey consisting of 24-hour recall of 3 days and blood analysis (glycated albumin and lipid profiles: total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides) were conducted before (baseline) and after (final) the treatment period.

Study B: The children's study focused on implementing a school lunch program during a school week. A crossover study design of School Lunch Week (a lunch meal and regular activities during break time) and Regular Week (no lunch meal and regular activities during break time) was conducted with 11-year-old students from two classes; the size of each class was about 25 students. During School Lunch Week, a lunch meal was provided to students at the second break time with the requirement to eat lunch first before the students could engage in their regular activities. The lunch meal was created in a one-week cycle that consisted of 5 school lunch menus and contained rice as the staple food, a side dish of plant protein, animal protein, and a vegetable dish. Anthropometric measurements were conducted before the study period. A questionnaire of students` characteristics and food habits (10 items) and nutrition surveys using the 3-day-24-hour recall method were conducted during the study period of each School Lunch Week and Regular Week.

Results:

Study A: A total of 47 women (24 in the vegetable group and 23 in the control group) completed the study. There were no significant differences in baseline values between the groups. At the final after the treatment for 21 days consecutively, in the vegetable group, with increases in vegetable and fiber intakes and decreases in energy, lipids, and carbohydrates intakes, blood lipid concentrations, body weight, and BMI ($p<0.05$). There were no significant differences in glycated albumin and triglycerides ($p>0.05$). In the control group, there were no changes found before and after the treatment period ($p>0.05$).

Study B: A total of 48 children completed the study. Nutrition assessments with BMI normal in boys and girls were (-2SD to 1 SD) 56% and 70%, overweight (1SD to 2 SD) 20% and 22%, obese (higher than 2SD) 12% and 4%, and thinness (-3SD to -2SD) 12% and 4%, respectively. There were significant decreases in both energy and lipid intakes during School Lunch Week ($p<0.05$). There were no changes found in protein, carbohydrate, and fiber intakes ($p>0.05$). During Regular Week, snacking frequency (times) for one day was 3.2±1.0 times and it decreased to 2.9±1.1 during School Lunch Week ($p<0.001$). Snacks contributed 36% of total energy (656kcal/day) during the No School Lunch Week; this decreased to 30%

(496kcal/day) during the School Lunch Week ($p<0.001$), while calorie contribution from Lunch increased significantly ($p<0.001$) from 23% of total energy (412kcal/day) during Regular Week to 32% (538kcal/day).

Conclusion: It was suggested that dietary strategies of consuming more vegetables for women and the implementation of a school lunch program for children can help to establish desirable dietary habits to control energy and lipid intakes. Daily consumption of more fiber from vegetables in overweight women improved lipid profiles and helped in weight control as well. The implementation of a school meal program can be a model of healthy dietary habits and its establishment should be considered in the future.

論文要旨

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インドネシアの女性と学童のエネルギー摂取調節に関する研究

背景:インドネシアは、経済発展と生活習慣の変化の結果,肥満が増え、そのために生活習慣病が増えている。私は、修士課程の研究で主婦と学童の肥満の主原因が、特にパームオイルの過剰摂取、および低野菜摂取量にともなう低食物繊維摂取量が原因であることを明らかにした。すなわち、インドネシアの人々の生活習慣病予防のためには、以上のような食習慣の改善が必要であろう。博士課程では、主婦(研究 A)と子供(研究 B)の栄養改善に関する二つの研究を行った。主婦の研究(研究 A)では、野菜の摂取量を増やして食物繊維摂取量を増加し、エネルギー摂取量が抑制できるかを調べた。パームオイル摂取量を低下させる試みは、インドネシア人の食習慣では困難と考えて実施しなかった。子供の研究(研究 B)では、学校給食が食生活習慣の改善に役立つかどうかについて研究した。インドネシアの小学校は、朝 6 時 30 分に始まり、午後に終わる。途中に 2 回休憩時間がある(8-9 時、11-12 時)。学校給食はないので、子供たちは空腹を満たすために休憩時間に学校周辺で売られている値段が安く、口当たりはよいがエネルギーが高いファーストフードやスナックを食べる。学校給食を提供することで、食行動が改善されるかどうかを調べた。

目的:主婦では野菜摂取量を増やすことによる肥満抑制と健康増進(研究 A)、子供では学校給食実施により食習慣が改善されるかについて明らかにすること(研究 B)。

方法:博士課程では、主婦(研究 A)と子供(研究 B)の二つの研究を行った。
研究 A:年齢、体重、生理、血液生化学値などの条件がよく似た 30 組のペアを作り、ランダムに 2 群(野菜群と対照群)に分けた。野菜群には、21 日間、毎日 400g の野菜料理を提供した。野菜メニューは、7 種類を作り、7 日ごとの繰り返しとした。介入の開始前と最後の週で、体位測定、3 日間 24 時間思い出し法による栄養調査、および血液生化学検査(糖化アルブミンおよび脂質:総コレステロール、LDL コレステロール、HDL コレステロールおよびトリグリセリド)を行った。

研究 B:一クラス約 25 名の2クラスで、通常の給食のない平日 5 日 (Regular Week)と給食を与えた平日 5 日(School Lunch Week)を、クロスオーバー法で実施した。School Lunch Week は、11-12 時の休憩時間、生徒が休憩時間の各種活動を行う前に食べてもらった。給食は、主食(米)、植物性たんぱく質、動物性たんぱく質、野菜料理を含むバランスのとれた

メニューとした。研究の前に体位測定を行った。School Lunch Week および Regular Week には、3 日間の 24 時間思い出し法による栄養調査、体位測定と食習慣（10 項目）のアンケート調査を行った。

結果:
研究 A：合計 47 人の女性（野菜グループ 24 人、対照グループ 23 人）が研究を完了した。2 群の各項目のベースライン値に有意差はなかった。 21 日間の介入で、野菜グループでは、野菜と繊維の摂取量が増加し、エネルギー、脂質、炭水化物の摂取量が減少、血中脂質濃度、体重、BMI が減少した（$p < 0.05$）。糖化アルブミンおよびトリグリセリド値に変化はなかった（$p > 0.05$）。対照群では、介入前後、どの項目にも変化は見られなかった（$p > 0.05$）。

研究 B： 合計 48 人の子供が介入研究を完了した。BMI から見た男子と女子それぞれの肥満とやせの割合（%）は、正常 56%および 70%、過体重 20%と 22%、肥満 12%と 4%、低体重 12%と 4%であった。学校給食週間中のエネルギーと脂質摂取量は有意に低下した（$p<0.05$）。タンパク質、炭水化物、食物繊維の摂取量に変化は見られなかった（$p > 0.05$）。1 日にとるスナックの回数は、Regular Week 3.2±1.0 回であったが、School Lunch Week では 2.9±1.1 回で 有意に減少した（$p < 0.001$）。Regular Week 中の、スナック、ファーストフードなどからのエネルギー摂取量は、総エネルギーの 36%（656kcal ／日）であったが、School Lunch Week では総エネルギーの 30%（496kcal ／日）に低下した（$p < 0.001$）。School lunch Week の昼食からのエネルギー摂取量は、Regular Week の総エネルギーの 23%（412kcal ／日）から、32%（538kcal ／日）に増加した（$p < 0.001$）。

結論：過体重の女性では野菜をより多く摂取できる食事は、エネルギーと脂質の摂取量を減らした望ましい食習慣を獲得するのに役立つことが示唆された。毎日、十分な野菜摂取で肥満および血清脂質異常が改善された。 学校給食がないインドネシアの子供に昼食として給食を提供することで、ファーストフードによる過剰なエネルギー摂取が改善されることから、肥満予防のためにも早急に開始されることが望まれる

Introduction

World economic development has consequence of changes in lifestyle, resulted in increasing tendency of lifestyle-related diseases year by year. In Indonesia, the prevalence of overweight and obesity has been increasing in a decade (1). From 2007 – 2018, obesity prevalence in men was 13.9 – 19.7% and in women 23.8 – 32.9%. The major cause of deaths including lifestyle-related diseases ranked from stroke, heart diseases, and diabetes mellitus, which became health burden in the country (1,2).

The role of healthy lifestyle and dietary habit are important to determine health strategies especially in preventive ways. Previous study found that 21% overweight and 40% obese housewives in Jakarta consumed high lipid sources and low vegetables, consequently low in fiber (3). Despite the high prevalence of overweight and obesity, energy intake of these women met the Indonesian Recommended Dietary Allowance (RDA) of 1900kcal/day. Indonesian RDA is available only in one level regardless activity levels. This indicated that RDA is too high for these women which might has light to moderate activities (3). The high energy intake was mainly contributed from high lipid intake, marking 36% of total energy intake (3). This can lead to the increase the risk of lifestyle-related diseases.

Higher fiber intake is recommended to maintain a healthy lifestyle through dietary habits. Acting as glycemic and plasma lipid control that inhibits excess absorption by layering, fiber can be a good way to modify diet in both prevention and treatment for lifestyle-related diseases (4-6). Fiber intake can be increased with high intake of vegetables, fruits, and grains (5). Ministry of Health Republic of Indonesia recommends fruit and vegetable combined of 300-500g per day (3-5 servings) for children and young adolescents, and 400-600g per day (4-6 servings) for adults, with two third of total intake comes from vegetables (7-9). Unfortunately, the vegetable and fiber intakes of the women found in previous study were very low, daily intake of 110g and 10g, respectively (3). Many investigations have been conducted to identify beneficial combination of daily diets with vegetables that has effects on health especially reducing cardiovascular diseases (CVD) risk and other lifestyle related diseases (4-6). It is essential to assess its effect practically, since this will provide more direct evidence for better dietary guidelines especially in controlling Body Mass Index (BMI), plasma lipids, and glycaemia as biomarkers for lifestyle-related diseases.

Children who stay obese may experience lifestyle-related diseases in adulthood and more likely to develop them at younger age. According to national basic health research, it was found that 19% of children in Indonesia suffer from overweight and obesity, with

Jakarta children having the highest prevalence of 30% (1). Reducing the future risk of these diseases can be maintained with healthy diets, weight, and food consumption start from early age. Recognizing that unhealthy diets are associated with lifestyle-related diseases, maintaining healthy dietary habit should begin from childhood.

Implementation of school meal program is common practice in the world, but there are countries that currently has no school meal program implemented like in Indonesia. School is a perfect place to promote healthy lifestyle and dietary habits through nutrition education and healthy lifestyle modelling (10). A school meal program, as one nutrition intervention in early age, can help in solving health and nutrition problems in school-age children (11,12).

The role of nutrition intake in lifestyle-related disease is important in determining the next steps in both preventive and curative ways. Suitable dietary strategy targeting women and children is the first major step to prevent lifestyle-related disease. As part of dietary strategy, higher fruit and vegetable intake daily has been suggested as a more efficient source of fiber intake. However, investigation conducted in Indonesia has been limited. Meanwhile, dietary strategy for early age should be started during school time. Therefore, the effect of school meal program in Indonesia should be investigated. For the purpose of constructing dietary strategies for women and children, I conducted two studies; by consuming more vegetables for women and by implementing school lunch program for children.

Study A. Strategy to control energy intake with more daily vegetable intakes in Indonesian housewives

Methods

Study A was conducted in 27 community health centers in 4 districts located in southern areas of Jakarta targeted overweight menopausal women as the subjects. Approval of the study protocol and procedures were obtained from Ethical Committee of the Faculty of Medicine, Universitas Indonesia (University of Indonesia) conducted in accordance with the Helsinki Declaration of the World Medical Association. Written informed consent was obtained from all the participants from the beginning of screening process.

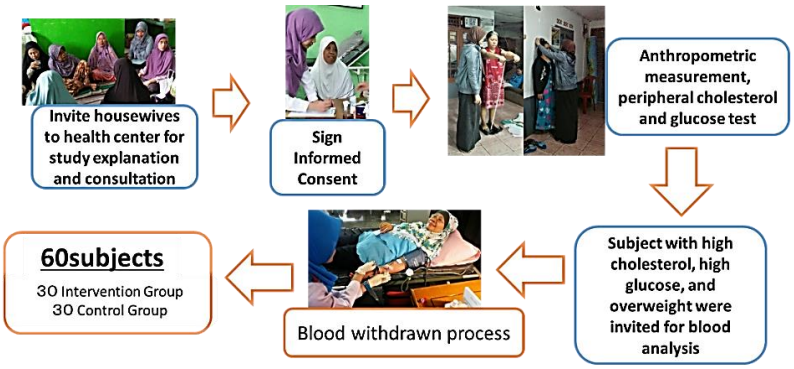


Figure 1. Screening Process Flow

The first screening process begun by reviewing data of the community health centers, then selecting overweight women, generally housewives, to be the target participants (Figure 1). BMI (kg/m^2) were categorized into underweight (<18.5), normal (18.5 – 25), overweight (25.1 – 27), and obese (>27) (1). Overweight women in this study were selected based on overweight and obese category combined. A total of 334 overweight women (BMI >25kg/m^2) were approached, informed about the study, and invited to community health center for more detailed explanation and consultation of the study (Figure 2). The participants who agreed to join the study were asked to sign written informed consent form. Next, assessment of their anthropometric status and basic data were conducted based on inclusion criteria of those who were overweight, menopausal, stay-at-home women with normal levels of activity, with exclusion criteria if they received psychological or pharmacological treatment, suffered from liver cirrhosis, nephritic syndrome, hyperthyroid, and steroid treatment, infectious diseases, and diabetes mellitus. The participants who passed these assessments were guided to continue to second screening process.

The second screening process begun by measurement of their cholesterol and glucose level using simple peripheral tests. Inclusion criteria at the second screening process were participants with high cholesterol level (>200 mg/dL). After passing peripheral blood test from 214 participants, blood-withdrawn and blood analysis of 108 participants were conducted to obtain their lipid profiles and glycated albumin level data. After obtaining the analysis results, there were 60 eligible subjects. Matched pair on the baseline for vegetable and control groups were decided with overweight, menopause, and on total cholesterol, then assigned to two parallel groups, in 1:1 ratio, 30 subjects for the vegetable group and 30 subjects for the control group. Sample size calculation is shown in Figure 3. A number which made significant difference on fiber intake from previous study was inputted on the formula (13).

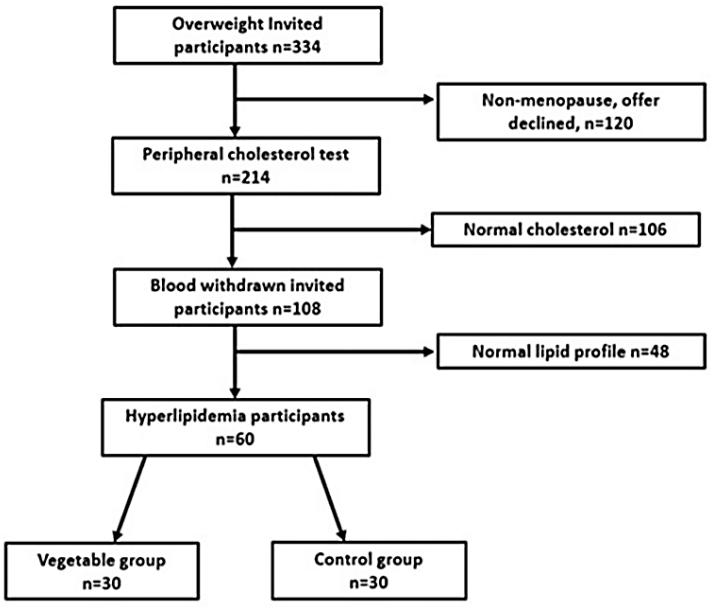


Figure 2. Subject recruitment process

$$\mathbf{n} = Z^2_{(\alpha.\beta)} \frac{2s^2}{\Delta^2} = \mathbf{23}$$

$Z^2_{(\alpha.\beta)} = 10.5$, 95% confidence (α=0.05 → 1.96) and power 90% (β=0.1 → 0.84)

$2s^2 = 8$*, a number with expected significant difference

$\Delta^2 = 3.6$, delta μ1 - μ2 (SD)

For drop out anticipation, the sample size be increased to 30 subjects

n	30	30
	Intervention group	Control group

*8g of fiber intake can make changes on Body Weight, Lipid Profile, Blood Glucose, etc at Linh, etc. "Substituting Pre-Germinated Brown Rice for White Rice Reduced Body Weight in Healthy Overweight Vietnamese Women". AJD 2019

Figure 3. Sample size calculation for Study A

The design of Study A was a parallel study in 21 days treatment period in which participants had been interviewed for nutrition survey with 3 day 24 hour recall method, and had their blood-withdrawn and analyzed as the baseline data (Day 0), assigned to intervention group of 400g daily vegetable intake (vegetable group) and control group, and would have another nutrition survey and blood analysis after treatment period (Day 21) as the final data (Figure 4). Blood-withdrawn and blood analysis was conducted to obtained the subjects' biochemical variables, lipid profiles and glycated albumin. Treatment period of 21 days was used to find possible effects of treatment in glucose value based on albumin turn over, usually within 1-2 weeks, marked by glycated albumin level. The analysis of lipid profiles included total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides levels.

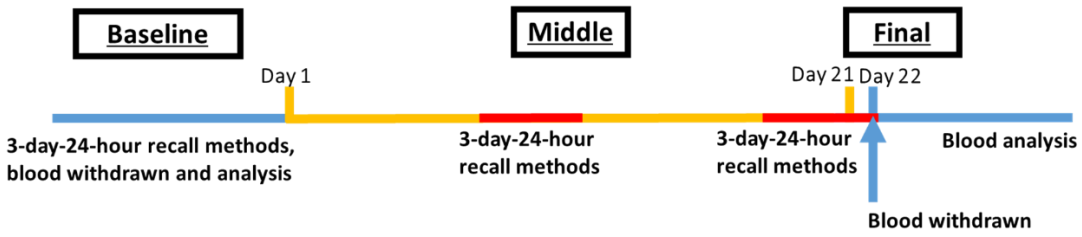


Figure 4. Study design to observe the effects of vegetable intake in housewives

The treatment for intervention group (vegetable group) was 400g of vegetables with a packet of mayonnaise and dressing, traditional peanut sauce and chili sauce, in which the vegetable group subject could choose any dressing/sauce according to their preferences. The vegetables were weighed before cooking process. Blanching method was used in cooking process to maintain the maximum nutritional value of the vegetables. The 400g vegetables were divided into two packs, each with 200 grams of vegetables and had on average 150 kcal per 400 g vegetables (Figure 5). The subjects in the vegetable group were given 400g/day vegetables and asked to maintain their usual dietary habits, only with the addition to include 400g/day vegetables in their diet. As for the activities, both groups were asked to maintain their usual daily activities.

Figure 5. Vegetable menus, each picture is one pack contains 200g of vegetables

The vegetables were delivered daily to each subjects` house in the vegetable group, while the control group were visited twice a week to recall their dietary intake and to receive nutrition education. The nutrition survey with 3 day 24 hour recall method were conducted three times; baseline, middle week, and final (Figure 6). Energy, protein, lipids, carbohydrates, fiber, and vegetable intake were obtained from each nutrition survey. The fiber and vegetable intake included all intake during the study, including the 400g vegetables were provided for the vegetable group. Statistical analysis were conducted with Paired Student`s *t*-test ($p<0.05$), Unpaired Student`s *t*-test ($p<0.05$), and Tukey`s Test ($p<0.05$).

Figure 6. Example of nutrition survey activities

Result

Thirteen subjects from the 60 subjects dropped out of the study; thus 47 subjects (vegetable group n=24 and control group n=23) completed the study. Dropping out reasons were personal reasons, refusing blood withdrawal after treatment, and exclusion due to incomplete records. Table 1 shows the characteristic and biochemical parameters of the subjects by group. There is no significant difference in baseline values between the groups. At the final after the treatment, the vegetable group shows significant reduction within the group in weight, BMI, total cholesterol, LDL cholesterol, and HDL cholesterol ($p<0.05$) compared with baseline data. These significant differences were not found in the control group ($p>0.05$). There were no significant differences in glycated albumin and

triglycerides values within group and between the vegetable and control groups after 21 days treatment period ($p>0.05$).

Table 1. Subjects` characteristics and biochemical parameters

	Vegetable Group n=24		Control Group n=23	
Variables	Baseline	Final	Baseline	Final
Age (years)	55 ± 3.2	55 ± 3.2	55.8 ± 3.2	55.8 ± 3.2
Height (cm)	147.5 ± 5.7	147.5 ± 5.7	149 ± 4.5	149 ± 4.5
Weight (kg)	62.5 ± 7	60.3 ± 7*****	59.7 ± 6.4	59.9 ± 6.4
BMI (kg/m^2)	28.7 ± 2.6	27.7 ± 2.6*****	26.9 ± 2.7	26.9 ± 2.7
Glycated Albumin (%)	13.6 ± 1.6	13.5 ± 1.7	13.6 ± 2	13.6 ± 1.8
Total – Chol (mg/dl)	238 ± 36.5	220 ± 33.5*****	238 ± 37.6	236 ± 44.2
LDL – Chol (mg/dl)	154 ± 28	139 ± 24.5*****	144 ± 30	145 ± 32
HDL – Chol (mg/dl)	54 ± 11.6	50 ± 9*	50 ± 6.2	50 ± 6.1
Triglyceride (mg/dl)	135 ± 51.8	131 ± 69	157 ± 74	141 ± 68.8

Data are shown in mean ± SD. *Significantly different at $p<0.05$ within Vegetable Group (Paired Student`s *t*-test)

Table 2 shows energy and nutrient intakes of both groups. Within the vegetable group, energy, lipids, and carbohydrate intakes show significant decreases ($p<0.05$), fiber, and vegetable intake show the significant increase ($p<0.05$), and no significant changes in protein intake ($p>0.05$). There was no significant difference in those parameters within the control group ($p>0.05$). At the final data, the vegetable group and the control group show significant differences in energy, lipids, carbohydrate, fiber, and vegetable intakes ($p<0.05$), except for protein intake ($p>0.05$)

Table 2. Subjects` energy and nutrient intakes

	Vegetable Group n=24			Control Group n=23		
	Baseline	Middle	Final	Baseline	Middle	Final
Energy (kcal/day)	2055 ± 32^{ab}	1615 ± 176^{a}	1607 ± 128^{b}	2005 ± 380	1943 ± 248	2009 ± 332*
Protein (g/d)	57 ± 14	46 ± 14	49 ± 12	56 ± 18	53 ± 17	51 ± 14
Lipids (g/d)	89 ± 29^{ab}	70 ± 19^{a}	69 ± 24^{b}	97 ± 30	83 ± 25	86 ± 27*
Carbohydrate (g/d)	260 ± 39^{ab}	205 ± 64^{a}	201 ± 52^{b}	239 ± 54	258 ± 32	264 ± 41*
Fiber (g/d)	9.5 ± 3^{ab}	21 ± 3^{a}	23 ± 4^{b}	11 ± 3	10 ± 2	10 ± 3*
Vegetable Intake (g/d)	83 ± 27^{ab}	387 ± 11^{a}	393 ± 5^{b}	85 ± 11	88 ± 17	94 ± 30*

Data are shown in mean ± SD.

*Significantly different at Final between groups ($p<0.05$, Unpaired Student`s *t*-test)

$^{a-b}$Figures with different alphabet indicate significant difference within group ($p<0.05$, Tukey`s Test). Figures with no alphabet indicate no significant difference ($p>0.05$).

Study B. Strategy to control energy intake with School Lunch Program in Jakarta Public Elementary School Children

Methods

Study B was conducted with a monocentric, controlled, crossover design to assess the efficacy of a school meal program targeted at public elementary school students. Children attend school for nine years as compulsory education. Children in the local community mostly attend public school that usually located nearby their houses. Approval of the study protocol and procedures were obtained from Ethical Committee of the Faculty of Medicine, Universitas Indonesia (University of Indonesia) conducted in accordance with the Helsinki Declaration of the World Medical Association. Study B was conducted at a Jakarta public school in which regular activities of the students were maintained. The school was purposively selected based on the local district education committee's permission: no similar intervention had been conducted at the school and the selected school agreed to be the study site.

The subjects were 11-year-old 5th graders who had already been assigned to two classes, with about 25 students in each class, for a total of 50 students (Figure 7). A number which made significant difference on energy intake from previous study was inputted on the formula (14). Inclusion criteria included healthy children of 5th grader who had obtained signed informed consent from their parents. Exclusion criteria were 5th grader suffers any chronic diseases. Study B preparation flow is shown in Figure 8

$$n = Z^2_{(\alpha.\beta)} \frac{2s^2}{\Delta^2} = 22$$

$Z^2_{(\alpha.\beta)} = 10.5$, 95% confidence ($\alpha$=0.05 → 1.96) and power 90% (β=0.1 → 0.84)

$2s^2 = 173$*, a number with expected significant difference

$\Delta^2 = 82$, $\mu 1 - \mu 2$ (SD)

	Class A	Class B
n	25	25
Period 1	School Lunch	Regular Week
Period 2	Regular Week	School Lunch

*173kcal/day energy intake difference with and without school lunch. Nguyen Thi Thao. "A Study of energy intake by children with and without school lunch in Hanoi" – Jumonji Thesis 2018

Figure 3. Sample size calculation for Study A

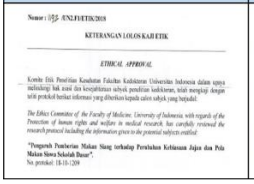
1) Ethical Committee & School Permission	2)Invitation for parents	3) Sign informed consent	4) Testing menu	5) Cook menu and delivery
				

Figure 8. Study preparation flow

The treatment was a school meal program providing school lunch meals during break time for a week (5 days) designated as School Lunch Week. Another week without treatment and with regular activities during break was designated as Regular Week. The lunch menu contained averagely 600kcal, about 30% of total energy RDA. The menus are shown in Figure 9 and included rice as the staple food, a side dish of plant protein (tempeh, tofu), animal protein (egg, chicken, beef), and a vegetable dish.


Rice, Coconut Milk Chicken, Fried Tofu, Sautee Vegetable


Rice, Sautee Beef & Vegetable, Fried Tempeh


Rice, Spicy Boiled Egg, Crispy Tempeh, Sautee Vegetable


Rice, Omelet, Crispy Tempeh, Sautee Vegetable


Rice, Fried Chicken, Tempeh Tempura, Sautee Vegetable

Figure 9. School lunch menus for a school week

Data collection was conducted on students' characteristics and food habits with question items shown in Table 3, anthropometric measurement as shown in Figure 10, and nutrition intakes with 3-day/24-hour recall methods in both Regular Week and School Lunch Week as shown in Figure 11. Child standard of BMI/Age for 11 years old children using Z Scores (Figure 12 and Figure 13), categorized as thinness (below -2SD), normal

(-2SD to 1 SD), overweight (1SD to 2 SD), and obese (above 2SD) (15,16). During School Lunch Week, there was no restriction on what could be consumed during break time. However, there was a requirement of eating lunch meal together in the classroom before the children could spend the rest of break time as they liked. During Regular Week, the rest of the break time was spent in the students` regular activities. Statistical analysis were conducted with Paired Student`s *t*-test ($p<0.05$)

Table 3. Questions for student`s characteristics and food habits

Question items
1. Who does meal preparation at home?
2. Is your mother living with you? If yes, what does she do? (Occupation)
3. Who influences you to buy snacks? (Multiple answers)
4. Do you usually bring a lunch box from home?
5. Do you eat breakfast every day?
6. What do you eat for breakfast?
7. How many times do you buy snacks in one day? (Frequency)
8. What kind of snacks do you usually buy/eat? (Multiple answers)
9. What kind of beverages do you usually buy/drink? (Multiple answers)
10. Let`s review what you had to eat yesterday! (Food recall)

Figure 10. Anthropometric measurement

Figure 11. Nutrition survey in school children

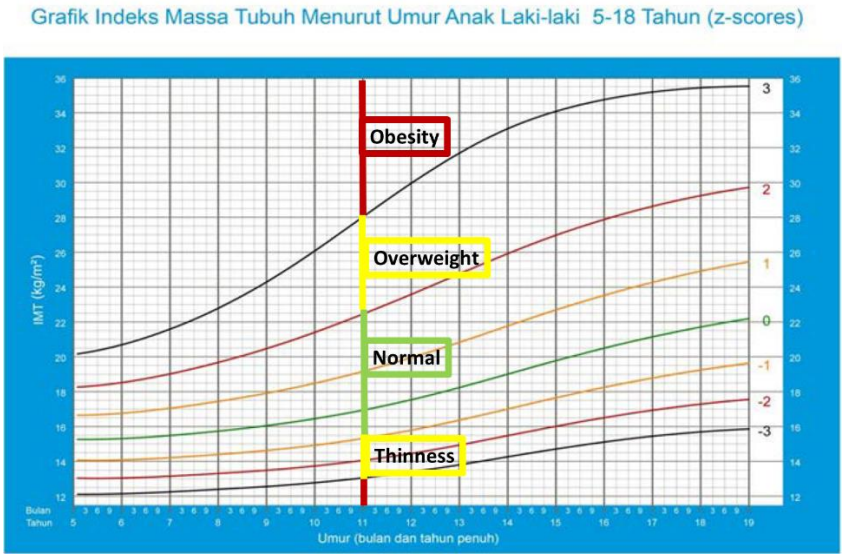


Figure 12. BMI/Age Z Scores Boys Graph 5 – 18 years old (in Indonesian, modified. Source: Ministry of Health Republic of Indonesia, 2011)

Figure 13. BMI/Age Z Scores Boys Graph 5 – 18 years old (in Indonesian, modified. Source: Ministry of Health Republic of Indonesia, 2011)

Result

There were 48 children who completed the study. Dropping reasons were due to their absences during the study period resulted in incomplete data collection. The school lunch program was conducted during the second break, the last break before the children finish the school day and then go home or go for extra-curricular activities. Figure 14 shows their regular activities during Regular Week and School Lunch Week. Without school meal program, the students usually buy food and drink nearby school or bringing meal box to school. Activities during the School Lunch Week included activity where the children eating lunch together in classroom.

(a) (b)

Figure 14. Break-time activity during Regular Week (a) and School Lunch Week (b)

Table 4 shows the BMI information of the subjects. The average BMI (kg/m^2) of all students was 18.1±2.9 with average BMI of boys and girls were 17.9±2.9 and 18.4±3.2, respectively. Figure 15 shows subjects` BMI categories percentages (%) whereas in boys and girls were 56 and 70 normal, 20 and 22 overweight, 12 and 4 obese, and 12 and 4 thinness, respectively.

Table 4. Subjects` BMI Information

BMI information	BMI (kg/m^2) mean ± SD
All student (n=48)	18.1 ± 2.9
Boys (n=22)	17.9 ± 2.9
Girls (n=26)	18.4 ± 3.2

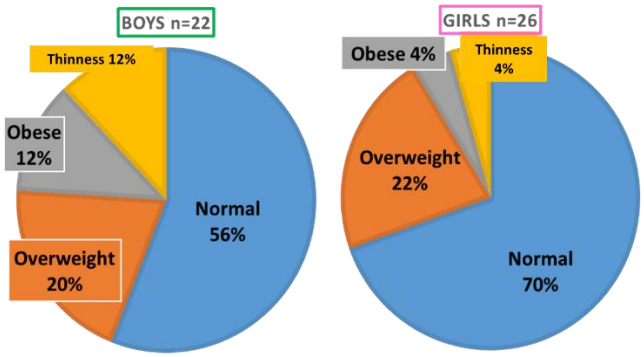


Figure 15. Subjects` BMI Categories Percentages

The subjects` basic characteristics and food habits percentage is shown in Table 5. For question "Who does meal preparation at your home?", the answers in percentage (%) were mother 87.5, grandparents 2.1, housekeeper 8.3, and no one (eating take-out food) 2.1. For question "What is your mother's occupation?", the answer in percentage (%) of their occupations were 36 stayed-home housewives and 64 working mothers 64 (entrepreneur, private employee, government official, etc). For question "Who influences you to buy/have snacks?", the multiple answers in percentage (%) show that 68.4 came from friends, siblings or relatives 35, TV commercials 28.9, parents 28.1, and 7 from online advertisements. For question "Do you usually bring a lunch box to school?", the answers were 58% responded No and 42% responded Yes.

Food related habits during Regular Week and School Lunch Week is shown in Table 6. For question "Do you eat breakfast every morning?" was separated into three categories of having breakfast every morning, some mornings, and no breakfast, with results shown in percentage (%) during Regular Week and School Lunch Week were 58.3 and 62.5 have breakfast every morning, 37.5 and 35.4 some mornings, and 4.2 and 2.1 no breakfast, respectively. For question "What do you eat for breakfast?" shows the breakfast food patterns, which were separated into categories of milk + bread, porridge, and rice + dish(es) shown in percentage (%). During Regular Week, students' breakfast was 67.3 rice + dish(es), 27.2 milk + bread, and 5.5 porridge. During School Lunch Week, breakfast was 60.7 rice + dish(es), 30.4 milk + bread, and 8.9 porridge. For question "How many times do you buy/have snacks in a day?" was separated into categories of snacking

frequency from 1 – 6 times shown in percentages (%). Further analysis for snacking frequency is shown in detail on Figure 15.

Table 5. Subject`s basic characteristics and food habits in percentage

No	Subjects` characteristics and food habits	Percentage (%)
1.	Who does meal preparation at your home?	
	- Mother	87.5
	- Grandparents	2.1
	- Housekeeper	8.3
	- No one, eating take-outs	2.1
2.	What is your mother`s occupation?	
	- Stay-home housewives	36
	- Working mothers (entrepreneur, private employee, government official etc)	64
3.	Who influences you to buy/have snacks? (Multiple answers)	
	- Friends	68.4
	- Siblings, relatives	35.1
	- Parents	28.1
	- TV commercials	28.9
	- Online advertisements	7
4.	What is your mother`s occupation?	
	- Yes	42
	- No	58

Table 6. Food related habits during Regular Week and School Lunch Week

No	Food related habits	Regular Week (%)	School Lunch Week (%)
1	Do you eat breakfast every morning?		
	- Yes, every morning	58.3	62.5
	- Sometimes	37.5	35.4
	- No, no breakfast habit	4.2	2.1
2	What do you eat for breakfast?		
	- Milk + bread	27.2	30.4
	- Porridge	5.5	8.9
	- Rice + dish(es)	67.3	60.7
3	How many times do you buy/have snacks in a day?		
	- 1 times	4.1	8.3
	- 2 times	18.8	31.3
	- 3 times	43.8	29.2
	- 4 times	25	20.8
	- 5 times	6.3	10.4
	- 6 times	2.0	0

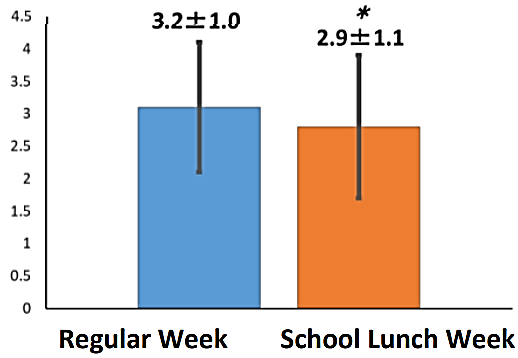


Figure 16. Daily snacking frequency (mean±SD) *Significantly different at $p<0.05$

Figure 16 shows the average daily snacking frequency. During Regular Week, snacking frequency for one day was 3.2±1.0 times and it was decreased to 2.9±1.1 in School Lunch Week ($p<0.05$). Figure 17 shows the snack patterns for question "What kind of snacks do you usually buy/eat?". Regular Week included 44% fried foods, 14% coconut rice, 8% noodles, 7% sweet bread, 7% meatballs, 4% seblak, 5% macaroni, 4% soto, 3% porridge, 2% shumai, and 2% other. School Lunch Week included 52% fried foods, 15% coconut rice, 8% noodles, 5% meatballs, 3% seblak, 4% macaroni, 2% soto, 4% porridge, 4% cilok, and 3% others.

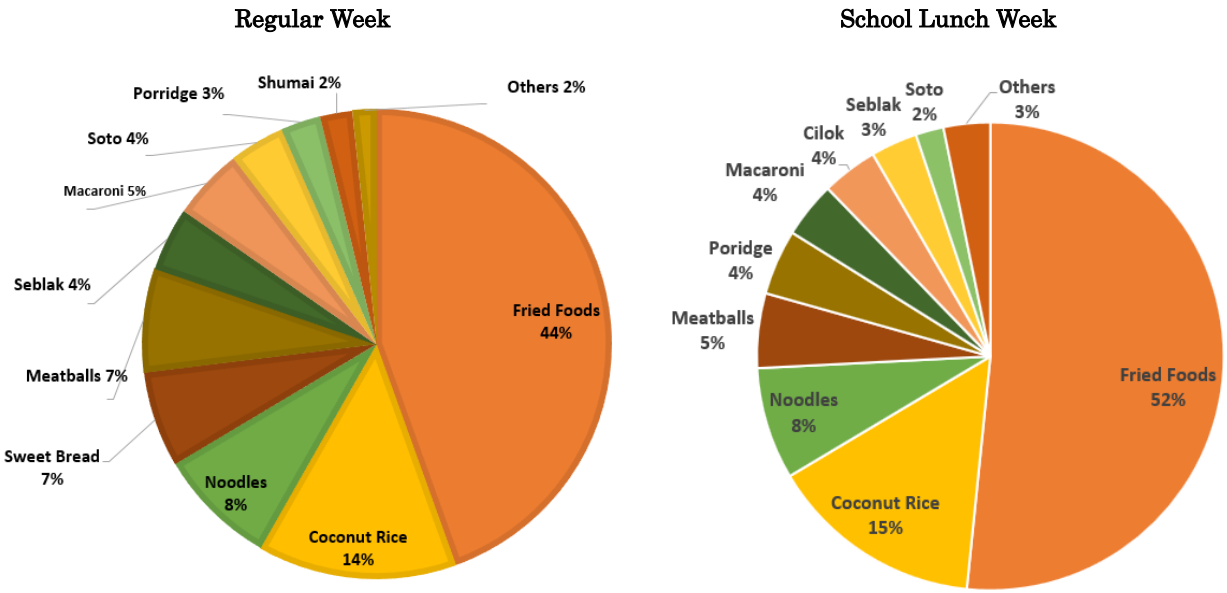


Figure 17. Snack patterns during Regular Week and School Lunch Week

Figure 18 shows beverages patterns for question “What kind of beverages do you usually buy/drink?”. Beverages patterns during Regular Week include 33% sweet tea, 22% milkshake powder, 10% flavored milk, 10% ice sweet milk, 7% mixed ice, 7% ice cream, 3% tea beverages, 3% jelly drink, 3% juice powder, and 2% other. Beverages patterns during School Lunch Week include 33% sweet tea, 22% milkshake powder, 4% flavored milk, 17% ice sweet milk, 10% mixed ice, 5% ice cream, 3% tea beverages, 2% jelly drink, 2% juice powder, and 2% other.

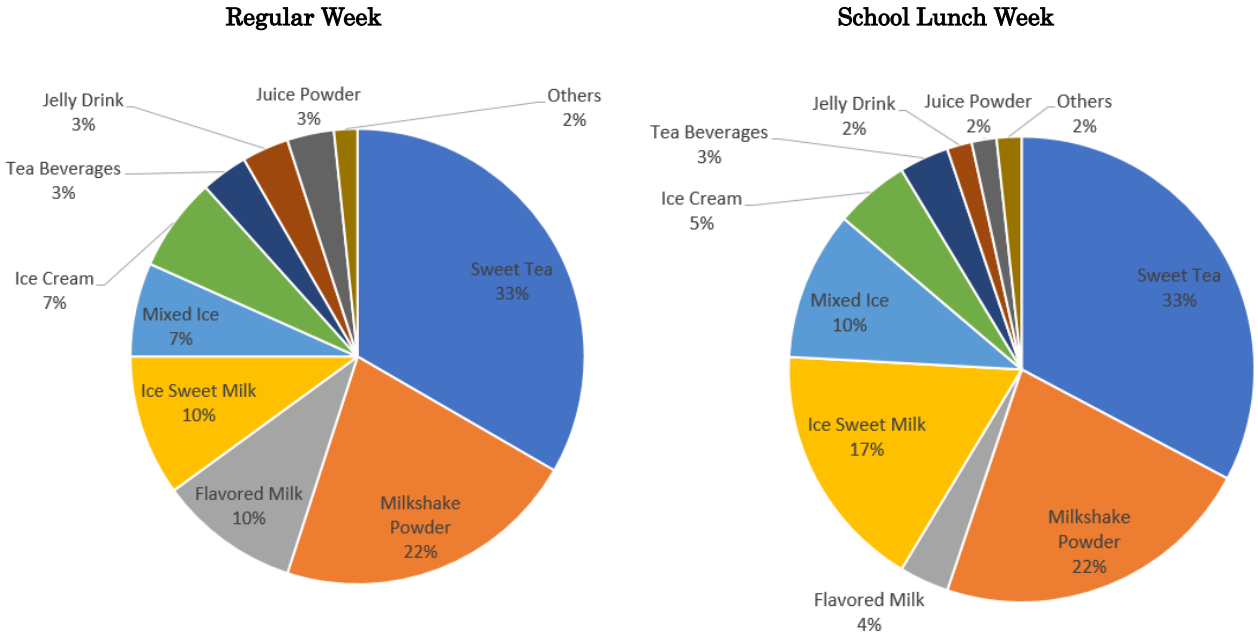


Figure 18. Beverages patterns during Regular Week and School Lunch Week

Table 7 shows energy and nutrient intakes per day during Regular Week and School Lunch Week. There were significant decreases in both energy and lipid intakes during School Lunch Week ($p<0.05$). Protein, carbohydrate, and fiber intakes remained unchanged. Figure 19 shows calorie contribution from breakfast, lunch, dinner, and snack. There was a significant increase in calorie contribution from lunch ($p<0.001$), also a significant decrease in calorie contribution from Snack ($p<0.001$) during School Lunch Week.

Table 7. Nutrient intakes during Regular Week and School Lunch Week (n=48)

Nutrient Intakes (per day)	Regular Week (mean±SD)	School Lunch Week (mean±SD)
Energy (kcal)	1852±328	1709±297*
Protein (g)	55±16.5	53±13.6
Lipid (g)	74±18.6	67±16*
Carbohydrate (g)	240±66	223±47
Fiber (g)	6±2.7	6.4±2.5

*Significantly different at $p<0.05$ by paired t-test

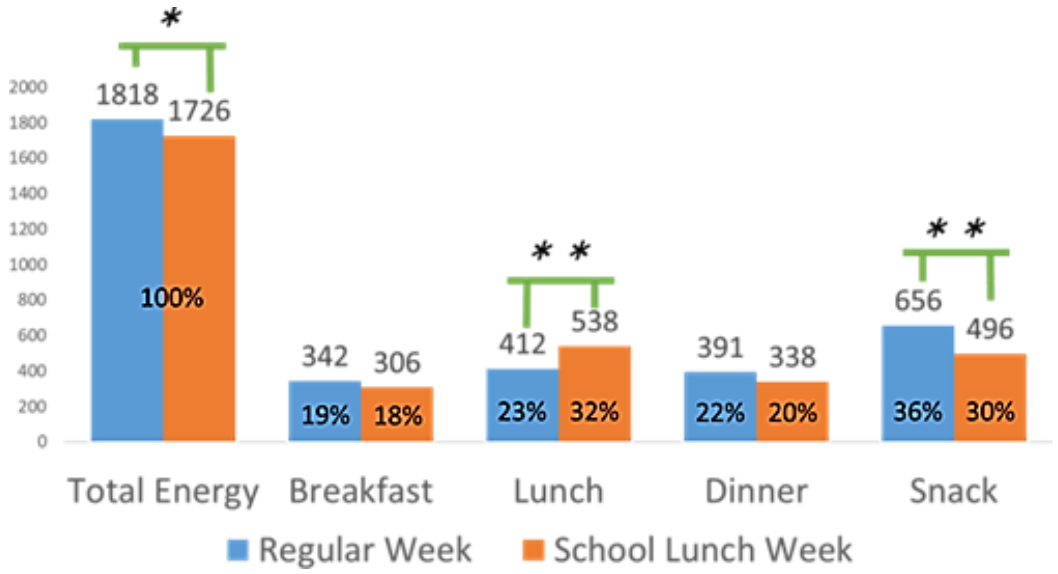


Figure 19. Daily calorie contribution from breakfast, lunch, dinner, and snack (n=48)
Significantly different at *$p<0.05$ and **$p<0.001$, respectively

Discussion

High prevalence of overweight and obesity accompanied by growing health problems of lifestyle-related diseases in Indonesia alarmed the government to make prevention movements (9). Indonesian government has been implementing health promotion movements to improve healthy lifestyle habits since 2015, such as induce more physical activities, avoid smoking, and have more balance nutrition campaign (9). The campaign has not seem to show any favorable impacts on Indonesian health.

In order to improve favorable impacts on Indonesian health, this study evaluated the construction of new dietary strategies focusing on more vegetable intake in women and implementing school meal program in children. In this study, the subject housewives and children were from average, middle class families. All the subjects for Study A were overweight women. The subjects of Study B were school-children with prevalence of overweight and obesity in boys was 32% and girls was 26%, similar with government report(1).

In Study A, the dietary strategies was to involve the real implementation of 400 g/day vegetable intake in Indonesians, which can be considered as fostering a new dietary habit for Indonesians, by including higher amount of salad using mayonnaise, dressings and traditional dressing, peanut sauce and chili sauce. The amount of 400g/day was decided following Indonesian government recommendation, ranges from 3-6 servings (300-600g) per day (7-9). However, the actual implementation of taking recommended amount has not yet been observed. The recommendation was decided based on WHO recommendation for vegetable and fruit intake, of 250g and 150g respectively (17). This recommendation was set as part of healthy diet to maintain healthy lifestyle in the prevention of chronic diseases (17)

Although there is a recommendation to consume certain amount of vegetables to maintain healthy-lifestyle, the national descriptive survey conducted by the government of the question “Do you often include vegetable in your food?” showed that 98% of Indonesians do not have the dietary habit of eating vegetables (18). This means that almost all Indonesians do not include vegetable in their daily dietary habit and through Study A, a new simple dietary habit was introduced. New simple dietary habit is considered as a dietary habit which is reinforced as an elevated habit from existing habit to become a routine in daily life (19). It includes time perspective of how the future of the subject will be pictured by maintaining healthier dietary habits (20,21).

There are several ways for Indonesians to consume vegetables. Most common is boiling vegetables, drain the water, then serving them with traditional dressings such as

peanut sauce, coconut flakes, brown sugar sauce, dipping it in chili sauce and cane sugar sauce, or stir-frying like in Chinese cuisine. Other method was cooking vegetables in soup, either clear soup or coconut milk soup. These several methods show that vegetables are commonly included in Indonesian cuisine. However, economic development has changed people's habit towards their dietary and food choices. The habit of consuming fast prepared food and tasty items such as fried foods is adapted to fit with rapidly growing life of the people. In this situation, people should adapt to healthier habit, which is simple and easily adapted to daily life.

Previous study found that daily vegetable of the housewives were 110gram (3). The housewives understood that vegetables are good for their health, but they did not maintain a certain amount of vegetable in their dietary habit. In Study A, four hundred grams were delivered to vegetable group subjects` home every day during treatment period. Every delivery, the subjects were asked to keep their vegetable wastes if any and return the wastes to researchers to be weighed. At the end of treatment period, daily total waste was only 1%, about 4g/day. This can suggest that the vegetable group subjects were forming new dietary habits during the study. They also showed the willingness to maintain the habit of eating more vegetable even after the study.

There were significant decreases in energy, lipid, and carbohydrate intakes, and significant increases in fiber and vegetable intakes. These results may be caused by the high portion size of added vegetable in the daily dietary habit. Energy intake, lipid intake, and carbohydrate intake were reduced by including 400 g/day of vegetables compared with having no added vegetable at all in previous daily food habit. There are studies which suggested that meal intake was reduced by eating a double portion of salad; eating a large portion of vegetable is an effective strategy for increasing satiety and reducing overall energy intake (22-24). Adding large portions of low energy dense salad decreased meal energy intake by 11-12% by increasing fullness while adding few calories, so that intake is reduced during the entire meal(25,26). Other studies have shown similar effects on meal energy intake by adding a fixed preload of low-energy-dense soup or fruit and have examined such factors as food type, macronutrient, energy, and food volume (23,24). Eventually, calorie intake reduction has an effect on body weight loss rather than metabolic changes (25-28)

Furthermore, the amount of vegetable could provide fiber, which contributed to lowering cholesterol levels and is expected to reduce the risk of CVD (29,30). In addition to the other reasons, LDL cholesterol reduction was probably caused by lower saturated fat intake, which has beneficial effect in reducing insulin resistance and chronic inflammation and contributes to lower risk of CVD(29,30). Another study of low-fat dairy

diets emphasizing higher intake of fruits and vegetables shows an associated improvement of the serum lipid profile(31)

Vegetables are nutrient-dense foods, have dietary fibers which can increase cholecystokinin responses, a hormone responsible for food satiety and slowing down gastric emptying process. Insulin sensitizing potential of leafy vegetables is suggested as adjuvants for oral hypoglycemic drugs(32,33). These features of vegetables have been used in designing low glycemic response food products. It was suggested that diet mainly in vegetables consumptions without changing in regular dietary habit, has similar features as low-fat foods consumption, the ability to maintain low glycemic response that enhance satiety, insulin sensitivity, and low postprandial insulin secretion(34). After 400 g/day of vegetables intake, there is no significant result found on glycated albumin. This may lead to the suggestion of weight control might has more influence in insulin resistance than the vegetable itself. Another study found that unless there is favorable effect on body weight, diets of fruit and vegetable would have indirect control in insulin resistance (35)

The Study A treatment period was 21 days, which was considered a better period for the turnover rate of glycated albumin which is 2-3 weeks and its effects on lipid profiles(36) There was such a decrease found in the study. We also found significant changes in lipid profiles, specifically in controlling total cholesterol, LDL cholesterol, and HDL cholesterol levels. Significant differences were found in body weight and BMI of the subjects, which suggests that these can be controlled by high level vegetable intake. To control body weight, some studies shows that diets resulted on lower carbohydrate intake includes protein from vegetables and oil can significantly reduce LDL cholesterol levels, which can contribute in reducing CVD risk.(37-41)

In reducing CVD risk, studies show that diet rich in composition of fruit and vegetables has beneficial effects on metabolic syndromes by reducing LDL cholesterol levels (37-41) Diets such as Mediterranean diet which focus on carbohydrate and protein sources from legumes and soy, are associated with reduction of coronary artery disease progression, weight loss, and LDL cholesterol level(39-40) The diet would affected on HDL Cholesterol level as the lipid intake reduced, which low level will be a concern. CVD risk is best expected to be reduced by lowering LDL cholesterol level without repressing HDL cholesterol level (37-41). Lower triglyceride concentrations are observed with low carbohydrate intake, which might reflected lower glycemic load and gluten (42-44). However, despite showing slight reduction in triglyceride concentration, there was no significant differences found in triglyceride concentrations in this study.

The nutrition education to the control group was also to emphasize the importance of eating 400 g/day vegetables as recommended, with one brochure of daily balance

nutrition as tools. This one brochure was intended to make the subjects had easier understanding towards daily food consumption with the goal to encourage dietary habit of increase their daily vegetable intake. By this nutrition education, the control group managed to increase vegetable intake by 10 g/day. There is no significance difference found at the final, indicating by nutrition education itself for 21 days would not be enough to change dietary habit. Longer periods of nutrition education would have better results in metabolic syndrome control, which may take months to see the effects(34). This is also shows the necessity that nutrition education should be started from early age, in order to lower the risk of lifestyle-related diseases in later age.

Dietary strategy of implementing school lunch program to control energy and lipid intake in school-children was evaluated in Study B. This strategy was constructed because currently there is no establishment of school meal program in Indonesian public school. In 2008, WHO constructed School Policy Framework as one of WHO implementations for global strategy on diet, physical activity, and health (45). School Food Programme is part of policy options for food services environment where encouraged to support and facilitate healthy eating habits at the school (45). School lunch with appropriate nutrition and less waste found to be effective in reducing childhood obesity (46).

There is a reason why a school meal program is not established yet. Ninety percent of Indonesian schools are public schools. The school management is under the Ministry of Education. Even now, the government is still struggling to provide universal education in all areas of Indonesia. Inequality and social disparities are still high. Funding for education is one of the problems, not to mention funding for a school meal program. However, if a school meal program is provided/introduced at targeted area like Jakarta at the beginning, other areas may follow this example and may start school meal programs as well. School meal program can also provide reduced price or free-of-charge meals to have a uniform meal in school settings regardless the student`s socio-economic background (45)

There are methods on how to establish a school meal program, one example being the Japanese school meal program. The Japanese school meal program includes the employment of at least one licensed registered dietitian/nutrition teacher to help create 200 different menus/year that meet the dietary reference intakes and have high consideration and give priority to locally sourced food and introduce national food culture and tradition (47,48). The dietitian works in the school kitchen or works at a district kitchen to serve several schools simultaneously (47,48). The dietitian will also take consideration of recommended school lunch cost and allowance in menu planning, which parents/guardians pay only for the food materials of averagely about 250JPY

(approximately 2 USD) (47, 48). This cost will be tripled, if there is no support from the government for labor cost to conduct school lunch program: personnel, facilities, and maintenance (gas, water, electricity) (47, 48). It might be necessary to have legal developments for a school meal program in Indonesia on stakeholder level. In Japan, Shokuiku Basic Act involves the promotion of nutrition education throughout the life cycle, including the school lunch program (48). The government`s support for the labor cost and the role of dietitian securing the school lunch program implementation in Japan, recognized as part of education to introduce food system, food culture and custom, and nutrition knowledge (48). Since it starts at an early age, it may also be a positive force in instilling healthy food habits during childhood (48).

Study B results show that 32% boys and 26% girls were overweight and obese, which was close to national basic health research data (1). This indicates that the data from this study are representative of the actual population. Food habits of the children in terms of bringing a lunch box was that more than half of the children did not bring one have the habit, which explains the habit of buying food during break time. From the mother`s occupation result, assuming that one third of mothers are working at home and the remaining two thirds are working mothers, it is understandable that meals may not always be prepared at home and that bringing a lunch box to school is less frequent. Bringing a lunch box meal from home usually tended to provide adequate daily nutrition for the children (49). A lunch box meal can also become one good tool to prevent excessive intake of sugar, lipids, and sodium from fast foods (49-51). For both reasons, a lunch box meal is an option to establish favorable dietary habits which is effective if a school meal program remains unimplemented.

The habit of having breakfast might be related with the habit of bringing lunch meal box. Once breakfast is skipped, easy to develop the habit of skipping breakfast, and it is very likely to have a correlation with more frequent snacking during the day (52). Another study in children and adolescents found that skipping breakfast was associated with overweight/obesity and highly associated in children with working mothers (53). However, in Study B, it was found that having breakfast at home was already a regular habit. This might be another reason why the children didn’t have the habit of bringing a lunch box from home aside from the mothers` occupation status, because the children were already eating breakfast at home before school. In other words, the snacking frequencies might be influenced by something other than breakfast habits, which is likely due to the fact that there is no school meal program to satisfy children’s hunger during the school day.

Since bringing lunch from home is an option and there is no school meal program, children satisfy their hunger by buying foods and drinks from the food stalls in the area around the school. Despite no difference found in snacking patterns, the snacking frequency showed a significant decrease during School Lunch Week. Seventy percent of the children were snacking 3-4times on a usual day. This became less frequent, dropping to 1-3times on a School Lunch Week. This shows that the school lunch can help in controlling the snacking habit and in reducing daily snacking frequency. Studies in countries like Vietnam show the effectiveness of a school lunch in reducing snacking frequencies and total energy from snacks (14).

As for the snacking patterns, half of the snack patterns was fried foods. It does not matter that the size of fried foods had changes. There was 10% pattern difference in fried foods. Although fried foods was 10% higher during School Lunch Week, the decrease of total energy and lipid intake during the day of School Lunch Week could be marked by lower fried foods intake. Fried foods itself are easy to prepare, in terms of food safety and efficiency, and can be served as quickly as possible (54-55). This means that anybody can prepare fried foods, including meal prepper at home, much likely that the source of fried foods during School Lunch Week came from home. For the beverages patterns, the most popular drink was sweet tea, followed by milkshake powder drink. These drinks are also fast and easy drinks to prepare and are accessible to the children. The classification of snack can be separated into quality and composition (55-57). Higher quality snacks has richer nutrients than low quality snacks, for example an apple and a glass of milk compared with fried foods and sweets (54-57).

Children usually consume lower or no quality foods because the foods are easily accessed either in the school or at home (54-58). Snacking influence also become one factor that affect snacking habits. About 70% of snacking influence comes from friends, which also explains the impact that peer pressure can have on snacking habits. Social influence source, age, and sex of the child differentiate the food selection, where girls would try to convey healthy eating, but the boys didn't affected by social context, rather by high availability of snacks and beverages at school (59,60). Moreover, peer presence found affected adolescents' snack purchase, highlighting the factor that has influence on purchasing snack in adolescent (61)

A previous study found that school meal programs and nutrition education for school – children can provide adequate intake of energy, protein, carbohydrate, and fiber (62). In Study B, it was found that energy and lipid intakes were decreased during School Lunch Week. Moreover, when the energy contribution from breakfast, lunch, dinner, and snacks were compared, it was found that during School Lunch Week, energy from lunch

was increased and energy from snacks was decreased. These results show the favorable effects of school lunch in controlling energy and lipid intakes and also the energy contribution especially from snacks. School-based nutrition intervention programs are effective in establishing favorable dietary habits in children (62-64). In this case, a school meal program was proven effective even though it was conducted for only one week.

A school lunch program can improve the daily nutrition contribution based on the RDA of children 11 years old. One third of the RDA intake can be provided by the school lunch and the lunch meal provided in Study B was on average 600kcal/day. The energy contribution from Lunch was increased to 32% because there is a lunch meal to provide adequate energy despite there was common picky eater problem of some of the children didn't finish the provided lunch meal, not finishing the vegetable or not liking the tofu or tempeh which were provided for them. School lunch was served at break time and it was mandatory to eat the school lunch meal first before students could go on to other activities such as playing with friends or even buying additional snacks. As for the additional snacks the children might buy after eating the school lunch meal, it can be assumed that the children didn't buy fried foods as snacks, by the reason of the decrease in their lipid intake. Excess energy intake in school – children mostly results from snacking habits, despite its one purpose to satisfy hunger and eventually to meet energy and nutrient intakes (14,65). With no school meal program, during the longer break time children will satisfy their hunger through uncontrolled snacking. Some of the children usually consumed fast food from fast food restaurant chains with their family outside school time or during weekends.

There was no significant difference in protein intake and it met RDA for protein intake. The recommendation for protein intake in Indonesia includes three portions of animal protein like fish, meat, egg, milk, etc and three portions of plant protein like beans, bean products like tofu, tempeh, and fermented soybean like oncom (7). The lunches in this study included either one portion of animal protein or one portion of plant protein, which contributed at least 30% of RDA (7,8).

Despite the fact that vegetable production in Indonesia is quite high, there are many factors that might contribute to the low vegetable intake in both women and children in this study. Ordinary Indonesians usually have a custom called `Proper Eating`, meaning that even if a meal includes only rice and fried tempeh, it is considered proper. It has also become part of Indonesian habits to buy fast food when people are busy with work, which usually doesn't include vegetables and fruits.

Another factor is that the economic distribution in Indonesia is not the same in every place. Big cities, like Jakarta, tend to have higher living costs. Vegetable prices tend to be higher in big cities, since the food is produced in rural areas then distributed to urban

areas which affects its price. With higher prices for vegetables, people might hesitate to buy vegetables, since they might prefer other foods which are more filling than vegetables.

Even the price is high, it should be considered establishing the habit of eating more vegetables and fruits from an earlier age. Education is important to encourage the habit in daily life. More effective education about health and nutrition becomes a challenge, especially in the changes in social and economic development. Better strategies for health and nutrition education should be considered in order to implement favorable dietary habit such as increase fiber intake from vegetables and fruits and also by establishing school meal program as a model for healthy dietary habit. This condition might be crucial, but it depends on the situation within the country itself.

The limitation of Study A in women was its limited length: there might be more beneficial effects on longer study periods. There was no significant difference in glycated albumin levels, which suggested that a longer period of study may have control on blood glucose level. Another limitation is that daily visit must be done to provide the subjects with vegetable packs, which the subjects might feel constantly reminded to consume the vegetable packs. Further study on daily consumption of 400 g per day effects on glycemic response in the subject is recommended. Another recommendation for future study is whether the 400g per day vegetable consumption per day has similar outcome on overweight women in younger age (non-menopausal).

Study B in children has the limitation that the school meal program could be implemented for only one week (five days). It was not possible to see the longer-term effects of the school meal program like changes in breakfast habits, snacking influence resources, the timely period of snacking, and the nutritional status of the children themselves: their BMI status. A longer treatment period may be able to change these variables by focusing on children dietary habit especially when a decline in overweight and obesity is the target (66, 67). In conclusion, a school meal program could control the snacking habits and decrease energy and lipid intakes in Jakarta school-children and the establishment of school meal program should be considered

Conclusion

It is suggested that dietary strategies of consuming more fiber from vegetables for women and the implementation of school lunch program for children can help to establish desirable dietary habits to control energy and lipid intakes.

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