The Effect of School Lunch Program (SLP) Towards Nutrition Knowledge, Attitude, Practices and Nutrition Status of Adolescents in Islamic Boarding School

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INTRODUCTION

Background

The Indonesian government has established "Twelve Years Education Mandatory Program". The program's objective is that all 7-18 years old children pursue their education until senior high school. The problems that we are still facing are the high drop-out rate of elementary school students and there are many students that don't continue to senior high school or junior high school. According to the Indonesian Central Statistic Agency/ *Badan Pusat Statistik* (BPS), the percentage of drop-out children was 0.67% (BPS 2013). This is a complex problem that is not only caused by parents' poverty and the problem inadequate and improper education facilities, but also caused by low nutritional status and health condition of school-aged children which leads to low academic performance of the students in Indonesia.

Malnutrition in school-age children results in children becoming weak, tired and sick, so children are often absent and have difficulty following and understanding lessons at school. Many students are forced to repeat a year or leave school (*drop out*) due to severe malnutrition. This is a serious obstacle to efforts to enlighten the nation through education. The Basic Health Research Study/ *Riset Kesehatan Dasar* (Riskesdas) review of several studies show that nutritional problem in children and adolescent are still high.

Based on Riskesdas (2013), according to age criteria, 26.4% of patients with anemia were in 5-14 age groups while 26.4% of patients with anemia were in the 15-24 age groups. Based on this data, the prevalence of anemia is greatest among women, including adolescent women. According to the Department of Health (2008), 28% of adolescents in West Java suffered from anemia. The incidence of anemia in adolescents is strongly related to nutritional intake. Low intake of micronutrients (minerals and vitamins) is one of the causes of high incidence of anemia in adolescents. Kurniawan's research (2006) showed that the prevalence of anemia in adolescents in rural areas is quite high, that is, equal to 21.8%.

Anemia can cause fatigue, decrease concentration so that it decreases academic achievement, and can decrease productivity. Apart from this, anemia also decreases immunity so that those affected are more susceptible to infection (Permaesih & Herman 2005). Anemia occurring in adolescent girls also increases the risk of impaired physical and mental function, and may increase the risk of complications during pregnancy.

Elementary school-aged children and adolescents are in a rapid and active growth period. In this period, they need appropriate and adequate nutrient intake, in both quantity and quality. One of the nutrient intake fulfillment of school children and adolescent is obtained from the food consumed during school hours. Meanwhile, most of the schools in Indonesia does not have a good quality canteen, for providing nutritious, healthy, and safe food for the students. Morover, most of the students are not used to having breakfast at home so school canteen/cafetaria or food availability at school have an important role for fulfilling children's nutrient requirement at school. Thus, snack food safety and quality is the factor that needs attention so that students can consume healthy, nutritious, and safe food.

The government has initiated a number of projects to overcome this problem. To improve nutritional, the government implemented the Supplementary Food Program for School children/ *Pemberian Makan Tambahan – Anak Sekolah* (PMT-AS) from 1997-2000, then in 2010 and 2011 the PMT-AS program was reintroduced in the form of supplying snacks containing 300 kcal and 5 grams of protein, in 27 districts in 27 provinces. The PMT-AS program was stopped again because the evaluation found some weaknesses of the program, among others: 1) food was served in the form of snack loaded with carbohydrates and little protein, but no vegetables and fruit components (as a source of mineral vitamins), 2) it was given after 9 am so it did not meet the function as a breakfast substitute (supposedly before the activity / learning process begins) 3) it did not involve the school canteen in food production so that it required larger operational funds (needed to supply cooking utensils to the School Committee to process food), so it was not possible to maintain sustainability.

A review of several supplementary food programs/ PMT-AS have proven that providing supplementary food have positive effect on nutritional status,

attendance rate, and students ability in following classes at school. PMT-AS provides snacks while school meal service (school feeding) provides complete meal so that the benefit of school food service will be better.Whaley (2003) conducted a study on the impact of food interventions on cognitive development in school children in Kenya. In that study, there were four treatment interventions: meat, milk, energy and control (without intervention). Indicators of the effectiveness of the intervention could be seen in a cognitive test taken 3 times before, during and after the intervention (21 months). The results of the study showed that the intervention of providing animal food sources had a positive impact on the cognitive performance of school children in Kenya. Other studies related to feeding school children were conducted by Kustiyah (2004), which demonstrated that iron and protein consumption correlate positively with hemoglobin levels in elementary school children and that blood glucose levels have a significant positive effect on the improvement of word and image memory in elementary school children. A similar study conducted by Soetrisno *et al.* (2005), which analyzed the effect of adding high glycemic supplementary food on the concentration improvement of elementary school students showed that the intervention group's academic performance was better than the control group.

The results of the research conducted by Bogor agricultural university (Institute of in cooperation with Univ. of Tokyo in Japan which provided a lunch intervention for one month (August-September 2015) to school students in Sukajadi village, Bogor. This revealed a significant increase in nutritional status (body mass index, or BMI) and hemoglobin (Hb) levels before and after intervention. The results also showed that lunch intervention in the form of a balanced meal which constitutes 30% of Recommended Daily Allowance (RDA) can significantly increase carbohydrate, protein, calcium, iron, vitamin A and vitamin C intake. Furthermore, it was also shown that there was a significant change in nutritional knowledge scores and attitudes toward nutrition (unpublished research report).

In 2016, the Ministry of Education and Culture in cooperation with IPB, World Food Program (WFP) and other relevant stakeholders pioneered and implemented the School Child Nutrition Program (PROGAS) in three sub-districts

in East Nusa Tenggara Province. This program provided breakfast to children with a complete menu for 96 days. The results of this activity indicate that nutritional status was improved in school children receiving breakfast. The results of the PROGAS study showed an increase in energy intake and nutrients before and after the program, and the percentage of students with normal nutritional status also increased (69.1 % to 75.1 %). Mean Hb levels also increased (11.7 g / dl to 12.6 g / dl).

Many stakeholders have made efforts to improve nutrition, including the private sector through *corporate social responsibility* (CSR) programs. CSR PT Ajinomoto Indonesia has implemented various nutritional improvement programs in cooperation with the Department of Community Nutrition, FEMA-IPB. The Ajinomoto IPB Nutrition Program was a healthy school cafeteria empowerment program to provide nutritious and safe snack food for 3 years (2011-2013). This program consisted of nutrition education for students, teachers, parents and school snack vendors, supplementary feeding, school gardens and pioneering the establishment of a healthy canteen and school library. This activity resulted in improved nutritional status (anthropometry- body weight/age), anemia status and increased nutritional knowledge in students, and the healthy school cafeteria became a model for neighboring schools. In addition, PT Ajinomoto Indonesia actively supports nutrition-related activities such as the nutrition fair, and cooking competitions. The development of learning modules that integrate university courses with an understanding of monosodium glutamate and various food safeties related training programs.

Based on above mentioned, nutritional improvement in school-aged children in Indonesia is still needed, and one of the ways is by integrating nutrition education and providing lunch at school to support balanced nutrition behaviour change, as well as Clean and Healthy Lifestyle Behavior or *Praktek Hidup Bersih dan Sehat* (PHBS) which will improve the health and nutrition condition of the school. Thus, the Department of Community Nutrition, Faculty of Human Ecology, Bogor Agricultural University in collaboration with PT Ajinomoto Indonesia, a private company who has high commitment to support nutrition improvement, will

conduct nutrition education and school lunch program for students, especially in Islamic Boarding School.

Objective

a. Program Objective

School Luch Program (SLP) aims to increase balanced nutritional knowledge, attitude, and practice, as well as Clean and Healthy Life Style Behavior or PHBS through nutrition education and provision of lunch for students in Darussalam Islamic Boarding school to support and realize healthy and achieving students

The key performance indicators of SLP are as follows:

1. Number of beneficiaries
2. Number of eating days
3. Number of menus and average nutrient contents in developed lunch menus
4. Number of lunch menus finished (eaten completely) by beneficiaries
5. Number of nutrition education modules developed
6. Number of nutrition education sessions and classes conducted
7. Number of beneficiaries who attended nutrition education sessions
8. Number of nutrition education and training of trainers (TOT) classes conducted for teachers
9. Number of teachers who attended TOT on nutrition education
10. Number of training sessions on sanitation and hygiene of food handlers conducted
11. Number of food handlers who attended of training sessions on sanitation and hygiene
12. Development of school garden

b. Study Objective

The main objective of this study is to assess the impact of the school lunch program and nutrition education towards the change in knowledge, attitude, and behavior on balanced nutrition and clean and healthy lifestyle behavior.

The secondary objective is to assess the program impact on energy and nutrient intake, nutrition status, hemoglobin concentration, physical fitness and concentrating ability of students.

HYPOTHESIS

After getting the SLP, all of the participant will:

1. Increase in knowledge, attitude, and practice of balanced nutrition and healthy and clean lifestyle
2. Increase energy and nutrient intake
3. Improve nutritional status (BMI/age and middle upper arm circumference (MUAC))
4. Increase hemoglobin levels
5. Improve students' physical fitness.
6. Increase student's concentration (instantaneous memory)
7. Increase student attendance in learning activities at school

METHODOLOGY

Design, location and time

This research will be conducted using pre-post quasi experimental design. Subjects consist of only intervention group, who are measured before and after the intervention or program period. SLP in Darussalam Islamic Boarding School consists of:

a. Balanced Nutrition Education and PHBS for the boarding school students and teachers
b. Provision of lunch
c. Food processing training, food sanitation hygiene and food safety for food handlers.

The location of this activity is determined purposively at the Islamic boarding school, in the neighborhood of the IPB (Institut Pertanian Bogor) campus with the following basic criteria for the school:

a. Has apparent nutritional problems among the students
b. It has a kitchen and dining area for its students in need of improvement
c. Has a strong commitment to cooperate in running the program.

This activity will be held at the Darussalam Islamic Boarding School located in Laladon Bogor area. There are 450 students consisting of both male and female students. This Islamic boarding school has a kitchen that is used to process and cook food for the students. The eating area is divided into two areas, in the form of a shared dining room for the male students and a terrace for the female students. The Islamic boarding school also has a garden area that is used for gardening activities for the students but it has not been managed sustainably.

The overall project period is 18 months (2017/09-2019/03), which includes design, baseline, mid line and end line data collection (3 times), implementation and reporting activities. The implementation of the school lunch program will be for 1 academic year (8 active months after the reduction of holidays and examination months), starting immediately after Institutional Review Board (IRB) approval of both Bogor University and Ajinomoto Co. Inc. until Novermber 2018. Lunch will be served 7 days per week with the total of 220 days (Fig 1).

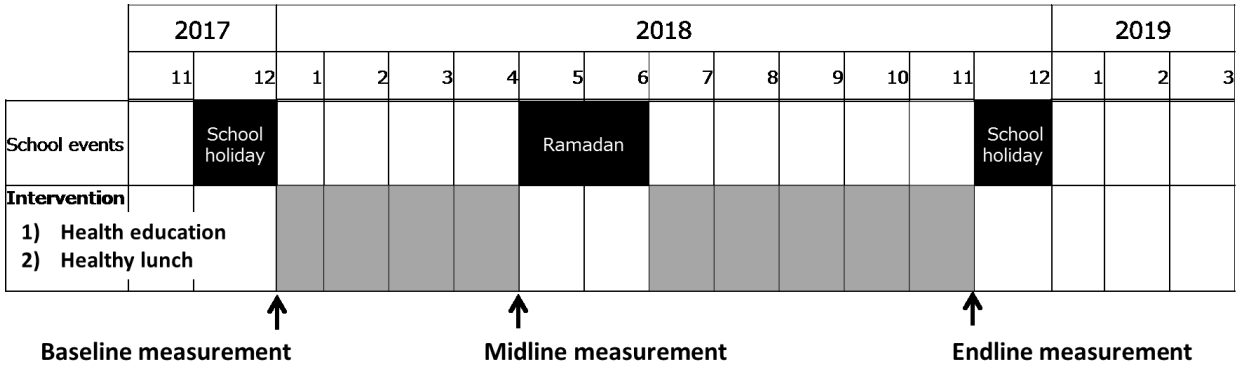

Fig1. Time schedule of the study

Subjects

Subjects are all the students residing in the Darussalam Islamic Boarding School which consists of adolescents' age 13-18 years old. All the children in the school (n=450) is included in the study to measure the primary outcome, which is change in knowledge, attitude and practice on balanced nutrition and clean and healthy lifestyle behavior. A blanket approach is used in this study due to the characteristic of the intervention, which is institutionalized in the school, where it is not possible to select only a sub sample of subjects to be given the intervention. The inclusion criteria of the subjects include 1) have resided in the boarding school at least one year, and 2) apparently healthy. Meanwhile the exclusion criteria are children who has Hb concentration < 7 g/dl or BMI for age z score < -3.

Only a sub sample of the subjects will be assessed for the secondary outcomes, especially in Hb concentration. The minimum sample size needed for the sub sample analysis is 150 subjects. This is based on the minimum sample size recommended by World Health Organization (WHO) (1996). The sample size was selected to detect a minimum change of 0.57g / dL in the subject's Hb level with a standard deviation (SD) of 1.01 g / dL, 95% confidence interval and 0.80 statistical strength. The sample size was calculated using the following formula (WHO, 1996):

$$n \geq \frac{2\,(Sd)^2\,(Z_{\beta}\ Z_{\alpha})^2}{d^2}$$

n = sample size

s = SD Hb level (1.01 g / dL)

Z_{β} = normal distribution with power 90% (1.28)

Z_{α} = normal distribution with 95% confidence interval (1.96).

d = mean difference of Hb level between two groups was 0.5 g / dL

Based on these calculations, the minimum number of subjects is 86 children. With addition of dropout rates, the total number of sub sample recruited is 150 subjects.

The 150 sub sample subjects are recruited through a screening phase for Hb concentration and nutrition status (BMI/age z score). Students who are shown to have Hb concentration of less than 11 g/dl for girls and 12 g/dl for boys and more than 7 g/dl for both boys and girls will be prioritized as the sub sample subjects. When sub sample size is not met, the next priority will be students with BMI/age z score less than -2 SD and more than -3 SD.

Recruitment, explanation of the subjects and informed consent

The recruitment of subjects begins with coordination with the teachers of the Darussalam Islamic Boarding School. Parents are invited to school after the holiday break and will be gathered. Explanation about the study and the participation of their children will be conducted during this meeting by the research team. Parents who approve their child's participation in this study will be asked to sign the informed consent.

Explanation of the study will also be conducted for the students in a separate classroom by the research team, accompanied by classroom teachers. If the prospective subject is interested, we will proceed to describe the study in detail and obtain his/her informed consent (see Appendix 1). The informed consent will be collected at the end of this presentation, in written form, from the subject and their parents or his/her legal representative (see Appendix 1).

Determining the menu

Menu planning is implemented by considering nutritional requirements for school-age children according to their age based on the following conditions:

a. The lunch menu should meet 30% of the daily nutritional requirements.
b. The lunch menu consists of a staple food, animal or plant-based side dishes, vegetables and fruit. Milk may be added to the lunch menu.
c. The lunch menu should be easy to process, be liked by the children, and use fresh, unadulterated local materials.

The following table shows the recommended daily nutritional requirements for students (adolescent) and the recommended portions of food and drink which were used as a reference in determining nutritional content of the lunch menu.

Table 2. Recommended dietary requirement for school children

Age group	Weight (kg)	Height (cm)	Energy (kcal)	Protein (gram)	Fat Gram	Carbohydrate (gram)	Fiber (gram)	Fe (mg)
Male								
13-15 years	46	158	2475	72	83	340	35	**19**
16-18 years	56	165	2675	66	89	368	37	**15**
Female								
13-15 years	46	155	2125	69	71	292	30	**26**
16-18 years	50	158	2125	59	71	292	30	**26**

Source: RDA for Indonesians 2013

Table 3. Recommended daily portions of food and drink for adolescents age 13-15 years and 16-18 years

	Food ingredients	Female		Male	
		13-15 years	16-18 years	13-15 years	16-18 years
Staple food	Steamed rice	4 ½ p	5 p	6 ½ p	8 p
Side dishes - animal products	Fish	3 p	3 p	3 p	3 p
Side dishes - plant products	Tempeh	3 p	3 p	3 p	3 p
Vegetable	Spinach	3 p	3 p	3 p	3 p
Fruit	Ambon banana	4 p	4 p	4 p	4 p
Oil	Cooking oil	5 p	5 p	6 p	6 p
Sugar	Cane sugar	2 p	2 p	2 p	2 p
Drinks	Milk	1 p	-	1 p	-
	Water	8 p	8 p	8 p	8 p

Key: p = portion
Source: Balanced Nutrition Guidelines 2014

The nutritional content of the lunch menu is designed to meet 30% of the daily nutritional requirements of students and contains 635-776 Kcal of energy with 18-22 grams of protein. The lunch menu is served in the form of a full menu consisting of staple food, animal products, plant products, vegetables and fruit by utilizing local food. The menu cycle used is a set menu cycle of 10+1 day cycle. An example of the menu is presented in the following table.

Table 4. Children's lunchtime menu cycle for 10 days + 1

No.	Food group	Cycle -					
		1	**2**	**3**	**4**	**5**	**6**
1	Carbohydrate	Steamed rice	Steamed rice	Steamed rice	Steamed rice	Steamed rice	Steamed rice
2	Animal protein	Fried chicken with spices	Yellow pickled fish	Boiled eggs in Sweet soy sauce	Spiced beef	Steamed-spiced Chicken (Chicken parcels)	Tuna with spicy sauce
3	Vegetable protein	Steamed Tofu (Tofu parcels)	Fried tofu	Tempeh cakes	Stir Fried tempeh in green chili	Tofu in spicy sauce	Steamed tofu and tempeh parcels
4	Vegetable	Vegetable stir-fry	Sautéed green beans with sweet soy sauce	Sautéed white mustard corn with meatballs	Clear vegetable soup	Sour clear vegetable soup	Clear vegetable soup with spinach and corn
5	Fruit	Papaya	Watermelon	Melon	Orange	Snake fruit	Papaya
	Food group	**Cycle -**					
		7	**8**	**9**	**10**	**1**	
1	Carbohydrate	Steamed rice	Steamed rice	Steamed rice	Steamed rice	Steamed rice	
2	Animal protein	Egg omelet with carrots and shrimps	Beef - Balinese style	Chicken in curry sauce	Steamed spiced fish	Quail egg and shrimp with spicy sauce	
3	Vegetable protein	Curry tempeh / tofu	Fried tempe	Potato cakes	Carrot and tofu roulade	Tofu cakes	
4	Vegetable	Sautéed beans - baby corn	Sautéed water spinach	Sautéed beansprouts with salted fish	Vegetables in clear broth	Kimlo	
5	Fruit	Banana	Watermelon	Melon	Banana	Orange	

Steps of the Study

a. Preparation

This program is held at the Darussalam Islamic Boarding School located in Laladon Bogor area.

b. Initial data survey (Baseline data)

Prior to baseline survey we begin with screening of Hb concentration and nutritional status (BMI/age z score) to select the 150 sub-sample for secondary objective assessments. This initial data survey is also expected to provide an overview of the subject candidate. We will include subjects who are anemia, stunted and are underweight as our sub sample subjects. After the screening phase we conduct baseline data collection which includes energy and nutritional intake data, knowledge, attitudes and practice of balanced nutrition (including Clean and Healthy Lifestyle Behavior, see appendix 5), short-term memory, and physical fitness. We also collect attandance in classes as secondary data (Fig 2).

c. Intervention

   a. Nutrition Education on Balanced Nutrition and PHBS

      The purpose of the nutrition education is to improve the knowledge about balanced nutrition and PHBS of students and teachers (See appendix 4). Nutrition education for students is conducted three times (2 sessions delivered by teachers, and 1 session delivered by research staff) every month throughout the intervention period. TOT for teachers is done every 2 months.

   b. Training of food processing, hygiene, sanitation, and food safety for food handlers will be conducted once a month.

   c. Provision of lunch

Before students are given intervention, all students will be provided with anthelmintic to be consumed. Lunch will be provided 7 times a week, from 12:00 to 13:00. Lunch is prepared and processed by three cooks at the boarding school. The description of lunch provision is as follows:

- Thepreparationandprocessingoffoodisdonemaximum 4 hoursbeforelunchandheld inside the boardingschool.
- The menuisevaluatedbythe person in chargeofthe program who has beentrained.
- The lunchdistribution isdecentralized, which is foodserved in thediningroomof male studentsandfemalestudents.
- Washhandsbeforeandaftermealsis mandatory for all students

This activity aimed to provide knowledge and skills for food handlers so they will be able to process food properly and safely. This training is conducted every month.

d. School garden

This activity is conducted to optimize the utilization of the school yard. The purpose of this activity is to increase the student's interest in agriculture and to get a better knowledge about vegetables and fruits.

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d. Monitoring and Evaluation

Monitoring and evaluation is conducted to ensure that the implementation of the intervention is based on the plan. Monitoring is conducted every month by collecting weight and height data, compliance of the student's consumption, evaluating of the menu, and evaluation of the absence of the students in the class.

e. Mid line and end line data survey

The midline and end line data survey are conducted to assess the impact of the intervention during the middle and the end of the intervention. Both

surveys are conducted by collecting the same data that is collected at baseline survey (Fig 2, see appendix 5).

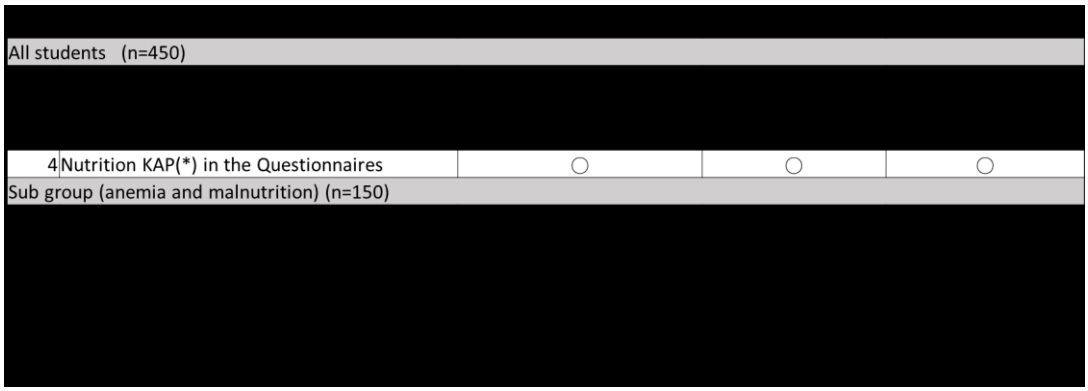

Fig 2. Data collection according to subjects

Types and Methods of Data Collection

The types of data collected are secondary and primary data. The secondary data are school profiles and attendance of students in the class. The primary data are characteristics of students (name, age, gender), medical history, family characteristics (age, education, parents occupation), eating habits, nutrient intake, knowledge, attitudes and practices on balanced nutrition and clean and healthy lifestyle behaviour, weight and height, physical fitness, concentration (short-term memory), and Hb concentration of the subject.

Secondary data isobtained fromthe students registry. Primary data are collected through interviews using questionnaires and direct measurements. Food consumption or nutrient intake data is collected by interviews using 24 hour food recall method. Bodyweight data is obtained by measurement using the weight scales with 0.1 kg accuracy. Body height data is obtained by measurement using microtoise with precision of 0.01 cm. Physical fitness is measured by the enumerator using the Indonesian Physical Fitness Test. Concentration data is obtained by conducting a test using a prepared questionnaire. Blood Hb data is obtained by taking blood in the finger prick capillary blood, then the blood Hb is determined using Hemocue. Table 5 below describes in detail the variables and indicators that will be measured during the study.

Table 5. Variableand data collection method

Variable		Collecting method	Collecting time
School profile	Name	Secondary data	Baseline
	Accreditation status		
	Address		
	Number of the students		
Student characteristic	Name	Interview with questionnaire	Baseline
	Age		
	Sex		
	Class		
	Address		
Family socio-demography	Father/mother's name	Interview with questionnaire	Baseline
	Father/mother's age		
	Father/mother's education		
	Father/mother's occupation		
Health history	Sickness occurred from the last 1 month	Interview with questionnaire	• Baseline • Midline • End line
Eatinghabits	Eating habits for source of protein, fruits, and vegetables from the last 1 month	Interview with questionnaire	• Baseline • Midline • End line
Study habits	Studying time, sleepy during studying habits, concentration.	Interview with questionnaire	• Baseline • Midline • End line
Knowledge, Attitude, and Practice (KAP)	KAP about balanced nutrition (Questions number 3-10, 12, 14 in the KAP questionnaire)	Interview with questionnaire	• Baseline

	Variable	Collecting method	Collecting time
about Balanced Nutrition and Clean and Healthy Lifestyle Behaviour	KAP about Clean and Healthy Lifestyle Behaviour (Questions number 1, 2, 11, 13, 15 in the KAP questionnaire)		• Midline • End line
Sports habits	Types of sports that often done	Interview with questionnaire	• Baseline • Midline • End line
Food intake	Intake of energy and other nutrients	2x24 hours recall (interview), translated into nutrients and compared with nutritional adequacy	• Baseline • Midline • End line
Nutritional status ofthestudents	Weight	Measurement with digital scale	• Baseline • Midline • End line
	Height	Measurement with microtoise	
	MUAC	Measurement MUACwith tapeline	
Anemiastatus	Hb concentration	Blood collection from fingerprick, the blood Hb is determined by usingHemocue.	• Baseline • Midline • End line
Physical fitness	Physical fitness	Indonesian PhysicalFitnessTest	• Baseline • Midline • End line
Concentration/shor-term memory	Short-term memory by remembering few of pictures and words	Measurement of short-term memory by remembering few of pictures and words (*Serial recall*)	• Baseline • Midline • End line
School attendance	Total days of absence from the last 1 month	Secondary data (student presence record)	

	Variable	Collecting method	Collecting time
	Total days of absence because of sickness from the last 1 month		Every month on intervention

Data Analysis

After data collection, the entry process will be followed by data cleaning to identify extreme value and check the validity of data. Descriptive and inferential analysis will be conducted, including univariate and bivariate with SPSS for windows version 20. Table 6 below presents the detail for data categorization.

Table 6. Variable and data processing category

Variable	Category	Source
Food intake and quality	• Severe deficits (<70% RDA) • Medium deficits (70-79% RDA) • Mild deficits (80-89% RDA) • Normal (90-119% RDA) • Over (≥ 120% RDA)	Ministry of Health (1996)
Nutritional Status	**Weight for Age Z-score (WAZ)** • Obese(> 2 SD) • Normal (≥ - 2 SD s/d ≤ 2 SD) • Underweight (<2 SD) • Severe underweight (< 3 SD)	Gibson (2005)
	Height for Age Z-score (WAZ) • Normal (≥ 2 SD) • Stunded (< 2 SD)	
	Weight/height • Obese (> 2 SD) • Normal (-2 SD s/d 2 SD) • Wasted (≤ -2 SD) • Severe wasted (< -3 SD)	
Anemia Status	• Normal (Hb>12 g/dL) • Anemia (Hb≤12 g/dL)	WHO (2001)
Knowledge of Balanced Nutrition and Principles of Clean and Healthy Living	• Good (>80%) • Fair (60-80%) • Poor (<60%)	Khomsan (2000)
Physical fitness	• Score: 22 – 25 = very good • Score:18 – 21 = good • Score: 14 – 17 = fair • Score: 10 – 13 = poor • Score: 5 – 9= very poor	Indonesian Physical FitnessTest-Ministry of Education (1999)
Concentration/short-term memory	• Poor (<80) • Good (≥ 80)	Kustiyah (2004)
Attendance at school	• Days of absence	

Variable	Category	Source
	• Days of sickness	

Statistical analysis consist of 2 types, which are univariate and bivariate.

a. Univariate analysis

Univariate analysis is used to describe the variable and presented as distribution and percentage of each variable. This type of analysis produce table of frequency distribution, bar chart, pie chart, or line chart from each variables and adjusted with the data scale to simplify the next analysis.

b. Bivariate analysis

Bivariate analysis is used to analyse 2 variables that are expected to have a correlation or significant differences. The statistical test is paired t-test that is selected based on data scale and normal distribution from dependent and independent variables that will be analysis.

To adjust for the effect of students' growth and gender towards the intervention outcomes, we will conduct a Linear Mixed Effect Models. The model will include gender, time, gender*time interaction which will allow the outcome of interest to be free from the effect of growth and gender.

The following table presents an alternative plan for different types of tests used to analyse the effects of lunch on changes in variables as an indicator of the success of this program.

Table 7. Variable and analysis method

No.	**Variable**	**Data Scale**	**T-test**
1.	Energy and nutrient intake	Ratio	Paired-t test
2.	Eating habits	Ordinal	Wilcoxon test
3.	Nutritional status • WAZ • HAZ • Weight/height	 Ratio Ratio Ratio	 Paired-t test Paired-t test Paired-t test
4.	Anemia status • Hemoglobin	 Ratio	 Paired-t test
5.	Knowledge of Balanced Nutrition and Principles of Clean and Healthy Living	Ratio	Paired-t test

6	Physical fitness	Ordinal	Wilcoxon test
7	Concentration/short-term memory	Ordinal	Wilcoxon test
8	School attendance	Ratio	Paired-t test

Discontinuation of the study

The subject will be invited to withdraw from the study if there is any suspect that he/she is not following the instructions. If the subjects or the legal guardian wants, for personal reason, to withdraw from the study, he/she will be free to do so, after having informed the project manager. The withdraw statement will be signed and by the subject and their parents or his/her legal representative and submitted to the project manager (See Appendix 2.). Following any adverse effect, the medical doctor responsible for the management of subjects to evaluate whether this effect requires discontinuation of the subject.

Ethical considerations

This study will be conducted in accordance with the Declaration of Helsinki (http://www.wma.net/en/30publications/10policies/b3/) and Ethical Guidelines for Medical and Health Research Involving Human Subjects (http://10.136.68.34/keijiban/K242/Ethical%20Guidelines%20for%20Medical%20anf%20Health%20Research%20Involving%20Human%20Subjects.pdf). This study protocol will be conducted after approval by the Clinical Research Ethics Committee of Bogor University and Ajinomoto Co., Inc. Procedures are fully explained to all subjects, and written informed consent is obtained from subject, parents/ legal guardian, and boarding school representative. We will contact the subject's parents by phone and by letter.

Privacy and Confidentiality

The samples and data will be stored in anonymous form, since each subject will be paired to a digit code.

Storage and handling of samples and information

The samples and data will be stored in anonymous form, since each subject will be paired to a digit code. Therefore, persons managing the data will not be able to identify the participant and merge his/her identity with results obtained during the study. Only the project manager will directly be involved in the study who will merge the name with the code will be able to do so. The digital file

containing the pairing will be securely locked. Data will be saved and stored in a special hard drive which is protected and only able to be accessed by the program manager.

Exclusion of subjects in the analysis

Subjects that do not meet 80% of compliance in menu eating and 80% of attendance in nutrition education sessions will be excluded in the analysis. These conditions include and not limited to conditions where extreme illness, not borne by the intervention, occurs based on the medical doctors/ physician's judgement.

Emergency procedures

We do not foresee emergency issues, as the study do not involve any invasive procedures. However, should any accident happen during the study, physician in charge of this study will examine for any health issues.

Conflict of interest

This study is conducted in joint research between Bogor University and PT Ajinomoto Indonesia. The subjects will not be paid for their participation in the study. Only the costs of medical exams and physicians will be covered by the project.

Publication

Publication of the data is regulated by the non-disclosure agreement signed between Bogor University and PT Ajinomoto Indonesia.

Place of facilities

The facilities for recruiting and collecting data of the subjects will be at Darussalam Islamic Boarding School.

Physician of responsibility

The Physician responsible for the management of the subjects will be dr. Naufal Muharam Nurdin, M.Si.

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