Balance Nutrition Messages Are Still Implemented in Preschools One Year Postintervention: Case Studies in Subang District, West Java, Indonesia

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Summary  Thirty-two teachers from 10 preschools in Cisalak subdistrict, Subang district, West Java province, Indonesia, received a two-day training on Balance Nutrition and My Plate in February 2018. The main messages underlined in the training were consume a variety of foods, drink enough water daily, wash your hands with soap, be physically active, and monitor your body weight. The training was followed by an eight-week implementation period to preschoolers aged 3 to 6 y. The knowledge of the teachers increased by up to 33 percentage points (average score: 69 to 82 pre- vs. posttest) after training, and the teachers answered correctly to the same questions 15 mo later. The mothers’ knowledge increased by up to 37 percentage points after parenting sessions. All seven teaching aids provided were used by end-line, but their usage decreased after seven months (range: 2 to 7) and further decreased by 12 mo postintervention (range: 2 to 5). A teacher’s handbook and a flip-chart were the two aids persistently used. The practices of washing hands with soap, bringing healthy packed lunches, and monitoring weight and height continued after 12 mo postintervention. Dissemination of Balance Nutrition knowledge to fellow teachers of the same school, colleagues from different schools, or to representatives of preschool associations was evident. Training should be scaled up to the district level, using trained teachers as trainers and adopting a cascade training method. National roll-out by teachers’ associations, in collaboration with the Ministry of Education and the Ministry of Health, could improve the knowledge of over 200,000 preschool teachers and potentially improve the nutrition of 19 million preschoolers.

Key Words  Balance Nutrition, My Plate, preschoolers, teacher training, Indonesia

Nutrition education to preschool-age children provides the basis for healthy food choices, which can ensure good eating behavior, promote optimal growth and development, improve school achievement, and improve productivity and income in adulthood, as well as reduce the risk of developing diet-related diseases in the elderly. About 8% of the Indonesian population, or 19 million people, belong to this age group (3 to 6 y). The number doubled for children aged 0 to 6 y. Deficiencies in nutrients, malnutrition, and consumption of unhealthy food are prevalent within this age group. One out of three children aged 4 to 6 y lacks energy, and one out of four lacks protein (1). Micronutrient deficiencies such as calcium, iron, and vitamin A and C are detected in children aged 6 to 12 y (2). One out of three children (31%) aged below five years is stunted or chronically undernourished, while 8% are overweight (3), showing the double burden of malnutrition. In children aged 3 to 4 y, the daily consumption of sweet food and beverages, as well as food with additives, is common (60%, 69%, and 76%, respectively, once or more per day) (3). On the other hand, the consumption of fruits and/or vegetables in children aged 5–9 y is limited to one to two portions per day from the recommended five portions (3).

Nutrition intervention through schools has proven effective in improving food variety, enhancing water consumption, lowering sweet drinks consumption, increasing fruit and vegetable intake, and improving the quality of packed lunches of preschool children (4, 5), as well as improving the nutritional status (6). Nutrition education provides mothers and children with knowledge, skills, and motivation to make wise dietary and lifestyle choices. Nutrition, health, and education is mutually reinforcing. Good nutrition is the basis for good health, and both contributes to effective education. Good education, especially among women and mothers, is an important factor in determining a child’s health and nutritional status. Children’s behavior develop, among others, through interaction at school with other students and the teachers.

The preschool setting is appropriate for behavioral interventions and a profitable investment because a return of 6.4 to 17.6 USD can be expected for every single USD invested (7). The investment can mitigate the impact related to the cost of inaction, which can put a burden on society, such as poor health, poor education attainment, and economic dependency.

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Data on nutrition education to preschool children or training of preschool teachers in Indonesia are limited. For this reason and the need to scale up the socialization of Balance Nutrition and My Plate messages, we conducted a pilot in 10 preschools from nine villages in Cisalak subdistrict, Subang district, West Java province. The Ministry of Health had started the campaign on Balance Nutrition in 2014 and My Plate in 2017. The pilot can be the start of a long chain of socialization and cascading efforts that can cover 4.9 million children aged 2 to 6 y who are attending 230,000 preschools in the country.

**MATERIALS AND METHODS**

The socialization of Balance Nutrition and My Plate started with the training of preschool teachers. Three trainers from Sakanti Consulting trained 32 teachers from 10 preschools in Cisalak subdistrict. Nine of the heads of the schools attended the training. The trainers from Sakanti Consulting received certification from a training organized by Master Trainers from the Department of Nutrition, Faculty of Human Ecology, IPB University, who developed the training module. The module was endorsed by the Ministry of Health and the Ministry of Education of Indonesia. The teacher training was organized for two full days on February 24 and 25, 2018. The training covered the following aspects: the four pillars of Balance Nutrition (food diversification, clean and healthy lifestyle, physically active, and growth monitoring), My Plate (type and portions of food recommended in one plate), early childhood learning, and parenting.

The trained teachers integrated Balance Nutrition and My Plate messages and activities into the school curricula and implemented the socialization for students and mothers for a period of eight weeks, from February to April 2018. During the implementation period, the teachers received supervision from Sakanti trainers. In November 2018, seven months postintervention, a representative of each school was surveyed using WhatsApp and/or telephone calls. The surveyed questionnaire consisted of 10 questions, covering the following topics: continuity of teaching and parenting, the use of teaching aids, continuity of practices such as handwashing and bringing healthy packed lunches, measurement of weight and height, improvement of school facilities, and further dissemination of the messages. In April 2019, or 12 mo postintervention, the same questions were asked again to the school representative. Nine of the 10 respondents were the same person as before.

Data were collected in four different periods: baseline (February 2018), end-line (April 2018), Postintervention 1 (November 2018), and Postintervention 2 (April 2019). Information on the source of water and the availability of handwashing facilities were assessed at baseline. Pre- and posttest knowledge of teachers were assessed using a multiple-choice questionnaire during the training. Pre- and posttest knowledge of mothers were assessed at baseline and end-line, using yes/no questions. Within the implementation period, parenting sessions for mothers were given twice, included one cooking session. The parenting session was organized during school hours when mothers waited for their children and was facilitated by a trainer from Sakanti Consulting. The continuous use of teaching aids was assessed in three different periods: end-line, Postintervention 1, and Postintervention 2. Seven teaching aids were provided to each school; one teacher’s handbook, one flipchart, several finger puppets, one storybook, two puzzles, two posters, and two stickers. In addition, a weighing scale and a height measurement were provided. The description of each teaching aid is given in Table 1.

The four practice-related activities that were reassessed during postintervention were: washing hands with soap, bringing packed lunches, and monthly weighing and height measurement of students. Support from the school management in terms of handwashing facilities was noted in all four periods. Dissemination of Balance Nutrition and My Plate messages to other colleagues within the same school or to different schools and audiences were assessed postintervention. The data were analyzed descriptively and using SPSS (Statistical Package for the Social Sciences) version 21 (paired t-test) by comparing the percentages of correct answers within each aspect.

**RESULTS**

The 10 selected preschools had 433 students, who were taught by 44 teachers. The number of children in one school varied from 20 to 70 students, aged 3 to 6 y. The number of teachers varied from four to five persons per school, with teaching experience from one to 14 y. Preschool activities run from Monday to Thursday, Friday, or Saturday for about two to three hours (from 07:30 to 10:00 or 10:30). One preschool located in a remote highland had more flexible hours depending on the presence of the students (usually from 10:00 to 13:00). The school had to adjust to the schedule of the parents, who usually go to the field in the morning. Eight schools had open spaces or gardens for the children to play in, but only two schools had a library.

Knowledge improvement of teachers and mothers

Of the 32 teachers attended the training, 59% had a bachelor’s degree and the rest were high school graduates. Of those with a bachelor’s degree, most (13 out of 19 teachers) held a degree in education. The only one male teacher who attended the training was the head of the subdistrict’s Association of Early Childhood Education (locally known as Himpunan Pendidikan Anak Usia Dini/HIMPAUDI).

Knowledge of the teachers increased by up to 33 percentage points (n=28). The average score of the pretest was 69 out of 100 (range: 50 to 88), and the average score of the posttest was 82 (range: 67 to 92). The average scores of correct answers related to My Plate and water consumption were statistically significantly different between pre- and posttest at a 99% confidence level (Fig. 1). One year postintervention, 10 of the surveyed
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teachers answered five of the same knowledge questions correctly. The five questions were on the four pillars of Balance Nutrition, the components of My Plate, the advantage of drinking enough water, the nutrient source of fruits, and examples of clean and healthy behavior.

Similarly, the mothers’ knowledge increased after parenting sessions. The increase is especially high for the knowledge of the portions of vegetables and fruits that should be placed on a child’s plate (31%, $n=274$, to 50%, $n=216$) and the amount of water a child should drink in a day (76%, $n=278$, to 93%, $n=218$). Knowledge related to the following two questions increased by five percentage points: fruits and vegetables are sources of vitamin and minerals (87%, $n=276$, to 92%, $n=217$) and cassava is a carbohydrate-source food other than rice (93%, $n=277$, to 98%, $n=218$).

**Continuity of the use of teaching aids**

The objective of the learning activities of preschoolers was to increase knowledge and improve practice and soft skills. The trained teachers were able to integrate the Balance Nutrition and My Plate concept into teaching topics taught between February and April 2018. The topics were related to profession, nature/environment/water/fire/air, recreation, communication tools, vehicles, and my country. All major topics depicted in the teacher’s manual, i.e., Balance Nutrition, My Plate, sanitation, physical activity, and weight monitoring, were delivered through those topics. The teaching activities were very diverse, including indoor and outdoor activities. The teaching aids were used to facilitate teaching activities.

The following activities were intended to increase the knowledge of the students: provision of information on various types of vegetables and their benefits to the body, socializing to drink 5 to 6 glasses of water daily, and advising to bring packed lunches consisting of the complete contents of My Plate. Examples of practical activities were cutting pictures of vegetables, assisting in the preparation of salads, tasting vegetables, and washing hands. Examples of activities to enhance soft skills were playing puzzles, singing, and dancing. The following two specific songs were taught to the students: “I Like to Drink Water” and “Steps of Handwashing.”

**Table 1. List of teaching aids provided to each school.**

| Type of teaching aids | Description | Contents |
|-----------------------|-------------|----------|
| Handbook              | 30×20.5 cm², color printed | Five topics: nutrition problems in Indonesia, principles of Balance Nutrition (*Gizi Seimbang*), My Plate (*Isi Piringku*), clean and healthy lifestyle, and physical activity and growth monitoring |
| Flipchart             | Contains 20 pages of color printed pictures | Food sources (carbohydrate, protein, mineral/vitamin), handwashing, drinking water, and milk |
| Puppet                | Finger puppets, made from fabrics | Contains seven figures with names, representing mascots of various food types: Koko (a round figure of rice representing carbohydrate), Yuri (a carrot representing vegetables), Babu (an apple representing fruits), Wawa (a chicken, representing animal-source protein), Nana (fermented soya bean [tempe], representing plant-source protein), Miki (a glass of milk), and two human characters named Dodo (a boy) and Mita (a girl) |
| Storybook             | 32 pages of color printed pictures, to be used with the finger puppets | Consisted of five stories: “Active and Clever,” “Smart and Happy,” “Healthy,” “Toy Store,” and “My Plate Restaurant” |
| Puzzle                | 20 cm in diameter, color printed, made from hard cardboard | Five-piece puzzle of “My Plate” to be placed in a circle-like form of a plate |
| Poster                | 41.5×29.5 cm² that can be mounted on the wall | Two types of posters: “Let’s Eat Fruit and Vegetables” and “Eat a Lot of Varied, Nutritious and Safe Food” |
| Sticker               | 10×14 cm² in size, colorful | Two types of stickers: “My Plate” and “Washing Hands with Soap” |
| Weighing scale        | Digital | Mita and Dodo character in the background, colorful, maximum height that can be measured is 170 cm |
| Height measurement    | 189×20 cm²; made from thick paper, can be mounted on the wall | |

**Fig. 1.** The average score of correct answers of pre- and posttest by teachers. ***Statistically significant at the 99% confidence level.**
All seven teaching aids (handbook, flipchart, puppet, storybook, puzzle, poster, and stickers) that were introduced in February 2018 were used by end-line. However, the use of teaching aids declined after seven months postintervention and further declined 12 mo postintervention. The range of teaching aids used was two to seven in November 2018 and two to five in April 2019 (Fig. 2). Only one school used all seven teaching aids seven months postintervention, and no schools used all aids after 12 mo postintervention. The two teaching aids that were still persistently used by all schools were the teacher’s handbook and the flipchart.

Six schools reported that at least one of the other five teaching aids was missing or broken. The most reported missing or damaged aids were the puppets, puzzles, and posters. The finger puppets are made of fabrics and used during storytelling. At end-line, all schools used the puppets for teaching, but seven months later only eight schools used them, and by 12 mo only four schools used them. The puzzles are made from semihard cardboard and contain small pieces. Puzzles were used by all schools at end-line, but their usage declined to seven schools by seven months postintervention. By 12 mo postintervention, no school was using puzzles anymore. One school reported that its puzzle set had gone missing. Stickers were also less used. By seven months postintervention, only five schools used them, and by 12 mo postintervention no school used them. One school was renovated; thus, all posters and stickers that were mounted on the wall were destroyed. The storybook, on the other hand, was used more: by eight schools in November 2018 and by seven schools in April 2019.

Continuity of good practices applied at the schools

The practices of washing hands with soap, bringing healthy packed lunches, and measuring weight and height lasted until one year postintervention. All four practices were continuously implemented by seven schools. All schools had access to clean water at baseline, four of which had already handwashing facilities with tap water. The sources of water varied: four schools had pipe water from the government, another four used mountain water, and the other two had well water. Six schools had access to clean water but no handwashing facilities yet at baseline. Two schools used running water from a pierced bucket or a used gallon water bottle to rinse the students’ hands. All schools did not provide soap for washing hands at baseline.

By end-line, the four schools that did not have handwashing facilities managed to provide a simple handwashing facility with running water from a pierced bucket or a big plastic water bottle. All the schools provided soap. Washing hands was conducted during the following times: before and after eating together, after playing with toys in the room, and after playing outside/in the garden. Students were able to implement the five steps of handwashing: (a) wet your hands with clean, running water; (b) lather your hands by rubbing them together with soap, on the backs of your hands, fingers, and both thumbs, until all parts of the hands are foamed; (c) lather the tips of your fingers and under your nails; (d) rinse your hands well under clean, running water until the foam is gone; and (e) dry your hands using a clean cloth, towel, or tissue, or air dry them. All 10 schools practiced regular handwashing with soap and rinsing students’ hands under running water after seven months postintervention, but nine continued the practice after 12 mo postintervention. In those schools that continued, handwashing activities were conducted before eating and after finishing an activity or playing. The reason for the school that conducted irregular handwashing was the lack of facilities and that the students did not have to bring packed lunches.

During the implementation period, the managements of all the schools were aware of the Balance Nutrition and My Plate socialization. The trained teachers, as our main contact persons, were instructed to request appropriate handwashing facilities from the school management. As a result, one school management had provided more tap water to facilitate handwashing activities. One school provided cloth for drying hands. Four
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By seven months postintervention, six teachers (out of 10) who were surveyed were confident to roll out the practice of bringing packed lunches was practiced every day or once a week depending on the school. This activity was not compulsory in two schools. The practice of bringing healthier packed lunches was noticed at end-line. Some good practices reported by teachers were (a) students had changed their preference to bringing vegetables and fruits as snacks; (b) they started to eat vegetables; (c) they were able to eat by themselves and finish their meals, eating breakfast without force; (d) reduction in the number of students who are picky eaters; and (e) reduction in purchasing cheap, nonnutritious snacks at street vendors outside the schools. Considering that there were street vendors available outside of five schools, this improvement is a good step toward healthy choices by the students. The street vendors commonly sold sugary or salty products and sweet beverages. The teachers prepared food together with the students from time to time, making healthy snacks from vegetables and fruits, and provided vegetables at schools to complete the students’ meal. Within seven months postintervention, seven schools continued this practice and one school discontinued it. Some of the reasons were lack of parents’ support and students already having breakfast at home.

Monitoring weight and height was suggested to be implemented monthly and documented. All schools had implemented this activity at baseline by weighing the children at a nearby health post. Weighing activities are regularly conducted every month for children under the age of five years as a government program. Growth monitoring of weight and height were carried out by all the schools during the intervention period from February to April 2018. However, after seven months postintervention, one school discontinued the practice. Of the nine schools that continued, three schools brought the students to a nearby village health post. Three schools reported that their weighing scales were broken. All schools reported measuring the height of their students between January and April 2019. Eight schools used the provided height measurement, and the others measured students’ height at a nearby health post. One school reported that the height measurement was torn. Dissemination of balance nutrition and my plate messages

By seven months postintervention, six teachers (out of 10) who were surveyed were confident to roll out the training to other fellow teachers. By one year postintervention, all teachers were confident to conduct training to other teachers. In November 2018, one teacher shared the Balance Nutrition and My Plate messages in a forum organized by the district’s Association of Early Childhood Education. She particularly shared the song on washing hands. In April 2019, four teachers disseminated the Balance Nutrition and My Plate messages to other teachers within the same schools, while one teacher shared the song “Steps of Handwashing” to fellow teachers during a meeting with the association.

DISCUSSION

Washing hands using soap was newly adopted after the socialization of Balance Nutrition and My Plate. Teachers admitted that handwashing habits were also new to them. After the training, teachers were stricter in implementing handwashing for students. Increased knowledge of teachers after participating in nutrition training was also observed in other studies (9–11). During our observations in some schools, students were able to put soap on their own hands and rinse their hands under tap water. When there were two or more tap water points available, the students did not have to queue up, but if there was only one pierced water bottle available, then the teacher assisted the students in pushing the lever so that there is enough water for all students. After 12 mo postintervention, washing hands is still regularly practiced by almost all schools. This showed that a simple clean and healthy practice can be taught and retained by both the teachers and the students.

The six recommended times of handwashing by the Ministry of Health (before eating, after eating, after going to the toilet, after touching animals, after gardening, and after touching money or garbage) (12) were gradually less adhered to throughout the postintervention period. At end-line, the teachers reported that handwashing was implemented at four to five out of the six recommended times (before and after eating, after playing inside and outside class). By 12 mo postintervention, washing hands at schools was carried out only at two to three of the six recommended times (before eating and after playing). This showed the diminishing practice of handwashing according to the recommended times. A refresher training program for teachers or a supervisory visit to the schools may be needed to reinforce the good practices. The provision of adequate handwashing facilities by the school management supports the continuation of handwashing practices.

The practice of bringing healthier packed lunches was supported by the gained knowledge of the mothers, the demand of the students, and the attentiveness of the teachers. The parenting session had improved the knowledge and practice of the mothers on preparing packed lunches according to the My Plate concept. More mothers prepared a complete meal, which included vegetables and fruits. One mother previously prepared snacks or noodles with eggs, but after attending parenting sessions, she prepared a complete meal for her child. Another mother was inspired to prepare a creative vegetable menu for her child, such as a carrot stick, so that the child wants to eat carrots. The mothers also started to pay attention to the amount of water that their children drink and to make sure that their children bring a water bottle to school. Some teachers provided vegetable dishes to those children who did not
bring vegetables in their packed lunch. Training of teachers, students, and mothers have proven successful in increasing the knowledge of the students and improving their eating habits, as well as improving the quality of packed lunches prepared by mothers (4). Early childhood education settings influenced students’ healthy food choices by providing healthy food and beverages, nutrition education, teacher role modeling (13, 14), and parental involvement (13, 15). Garden-based nutrition education can complement the promotion of fruit and vegetable consumption (16). The attentiveness of teachers due to increased nutrition knowledge was also found in another study (17).

The socialization of Balance Nutrition and My Plate trigged other positive outcomes, such as the provision of garbage cans and other cleaning utensils in the school area, the improvement of toilet facilities, and more variety of food given as supplementary feeding for students. One village is planning to carry out parenting sessions in the next school year, focusing on stunting reduction and My Plate messages and practices. The trained teachers of the two preschools located in this village will be involved in the activity. Some subdistrict offices are working together with the subdistrict’s Health Centers (locally known as Poskesmas) to form a Nutrition Post (Pos Gizi) in each village. The villages are planning to use 15% of their government allocated village fund for stunting reduction activities through this post. Information related to Balance Nutrition, child feeding practices, and washing hands will be relayed to mothers through these posts. The implementation of this activity will be supervised by the subdistrict’s health center. The trained teachers who were also the village health posts’ volunteers will be able to assist in growth monitoring of the preschool children living in their vicinity.

From our study, the following are characteristics of schools that are considered successful in socializing Balance Nutrition and My Plate messages: having many teachers with a bachelor degree, support of the school management in terms of facilities (e.g., classroom, playground, and library), and a low ratio of teachers to students. Based on a review of nutrition education to schools, successful interventions included those that engage parents on a face-to-face basis, training of teachers, involve experts in the implementation, and provision of age-appropriate activities in a short but frequent session (18). In this intervention, all components were integrated into the implementation. A Balance Nutrition education to primary school children in Turkey, which included training of teachers, provision of teacher’s handbook, and focus on best practices, managed to improve dairy and green vegetable intake of the children (19). Teacher training that is organized for one day or more, provision of comprehensive subject matter during the training, and follow-up support to the teachers during implementation are factors leading up to effective intervention (20). On the other hand, the following characteristics may hinder the socialization of nutrition messages: many teachers who are high school graduates, a high ratio of teachers to students, less support from the management, and location in remote areas with large distances between houses. Teachers with a bachelor’s degree tended to use more teaching aids than those graduated from high school. The ideal student-teacher ratio in a preschool setting is 4:1 (maximum 8:1) for students aged 2 to 4 y and 15:1 for students aged 4 to 6 y (21). Smaller classes and a lower child-teacher ratio enable teachers to interact more with students, which will have benefits for cognitive learning (22). In schools in which one teacher had to look after 12 or 17 students, as was the case for two schools in the study area, teaching activities would not be effective. Three common barriers faced by teachers in reinforcing good nutrition habits to their students are lack of time, absence of adequate resources, and countering parents’ food practices (23). For a successful nutrition education, an intervention should ideally be implemented for at least six months (18). In the case of Subang, the teachers continued disseminating Balance Nutrition messages until the next school year and to the new students.

The opportunity to educate healthy eating behaviors at an early childhood education setting is recognized worldwide. In this setting, there is a need to reprint puzzles, posters, and stickers using stronger materials. Dissemination of Balance Nutrition and My Plate messages should be scaled up to the district level using cascade training, organized by the local government and its related stakeholders (education, health, religion, and preschool associations).

Disclosure of state of COI

No conflicts of interest to be declared.

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