ORIGINAL ARTICLE

Barriers of Implementing a Nutrition Education Program for Adolescents in Rural Indonesian Schools

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ABSTRACT

Introduction: Nutrition education (NE) is a promising intervention in promoting behavior change. However, in developing countries where it is not included in the national curriculum, many barriers arise. The study aimed to explore the teachers' perceived barriers of implementing a nutrition education program for adolescents in rural Indonesian schools. **Methods:** A qualitative participatory action research approach was applied in three selected schools in Bogor, Indonesia. Focus group discussion was used as the main method of data collection, involving 12 teachers who have implemented the Health and Nutrition Program for Adolescents. Triangulation was conducted through observation and feedback questionnaire from students. Data from multiple sources were coded, categorized, and thematically analyzed. **Results:** Three themes and six subthemes emerged, these include 1) capacity of teachers (lack of training and lack of nutrition knowledge), 2) school support (time constraints and lack of funding), and 3) external environment (unhealthy street vendors and parent's lack of nutrition awareness). These identified barriers could be minimized by establishing a strong commitment of school principals, the inclusion of street-food vendors and parents, and also ensuring sufficient training of teachers. **Conclusion:** This study highlights the need for schools and program implementers to identify potential barriers prior to commencing NE and also strengthen opportunities within it. The barriers found in this study emphasizes the need for advocacy, sufficient training of teachers, and consideration of the external food environment. Further studies are suggested to confirm these findings, involving more informants and different settings, such as in the urban population.

Keywords: Teachers, Qualitative, Module, Principal, Behavior

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INTRODUCTION

The nutrient requirements during adolescence are usually high as it supports growth and development in this critical phase of puberty. The fulfillment of nutrients during this phase is extremely important, especially for girls who menstruate and with higher risks of anemia. Adolescent girls are also considered future mothers with the capacity of bearing children, therefore, need to have optimum nutrition and health condition (1). However, several studies have shown poor eating habits among adolescents, mostly influenced by peers and social interaction (2). Girls in this phase of life tend to limit their level of food consumption to maintain body shapes (3). Moreover, there is a high consumption level of fast food, high in saturated fat, sugar, and salt content, rather than vegetables and fruits among this group (4). These poor eating habits have an impact on the nutritional status of adolescents. Data from the Ministry of Health of the Republic of Indonesia showed that the prevalence of chronic energy malnutrition in non-pregnant women of reproductive age (WRA) 15–19 years is 36.3%, while anemia in pregnant women aged 15–19 years is 84.6%, both of which is the highest among other age groups of WRA. In the long term, this may contribute to high stunting prevalence in under-five children, which currently is still the major nutritional-related problem in Indonesia and commonly found in one out of three under-five children (5).

Lack of awareness and knowledge on health and nutrition of adolescence are among the main factors leading to the above-mentioned nutritional problems (6). Hence, nutrition education (NE) is a promising intervention in overcoming this problem with desirable results through behavior change (7,8). A systematic review revealed that nutrition education (NE) is one of the most commonly included interventions of an effective package to reduce stunting in most low- and

middle-income countries settings (9). In developed countries where NE is acknowledged as a means of improving health, it is taught as a subject in schools. The United States, for example, enforced it in schools through the Richard B. Russell National School Lunch Act (42 U.S.C. 1751 et seq.) and pending legislation H.R.2800 Nutrition Education Act, which requires a minimum of 50 hours for each student per academic year. Additionally, it is sustained by financial support from the state government (10). Japan is also well known for its national School Lunch Program and *Shokuiku* (Food and Nutrition Education), enactment through the School Lunch Law (11). However, in developing countries such as Indonesia, where NE is not yet a priority, it is not included in the national curriculum (12). Although, previous studies identified nutritional contents under certain subjects such as biology, physical activity, and health science, which were delivered in short proportions, ranging from two to three sessions throughout the year (12,13).

NE leading to behavior change requires a more intensive delivery, especially for adolescent girls, who would benefit from it maternally and help the child health in the long term (6). Studies have shown that its inclusion in the curriculum of junior high school, would improve nutritional knowledge, and eating behavior among the students, teaching-learning process, and parental support (14). To be applied and scaled up in various settings, there is a need for standard NE materials as a guide for teachers, as well as the program implementers. Also, a study showed that NE with interactive module is an effective learning tool in improving teachers' and students' knowledge in the long term (15). Hence, it is important to carefully design the NE modules to accommodate the needs of those delivering the messages.

Teachers are a major resource of information for adolescents in school. Based on a study, four out of five adolescents obtain health-related information from parents, teachers, and other adults (16). Therefore, teachers have the capacity of promoting healthy lifestyle behaviors to students (17). Also, there is a need for capacity-building programs for these teachers to help in delivering food and nutrition messages (18). Such programs have been implemented in rural schools, aimed to assess the impact of a teacher-led nutrition and health education program on the nutritional status of adolescent girls in junior and vocational high schools located in a rural area of Bogor, Indonesia (19). The rural area lacked the resources and facilities as well as limited access to information (20). Additionally, undernutrition is a common occurrence in rural compared with urban areas as a previous study in Indonesia showed that underweight, stunting, and iron deficiency are more prevalent in rural areas (21).

There is limited detailed documentation in the scientific literature on the preparation, implementation, and barriers of NE programs in schools, especially in developing countries where nutrition is not yet a priority in the school curriculum. Teacher's pivotal role in the provision of NE in schools is influenced by many individual and external factors (22,23). Understanding the teacher's perceived barriers of NE implementation provides valuable insights for program implementers in the development of successful NE programs. Studies on teachers' barriers in implementing NE programs in schools have been explored in some studies (22–25), however still limited in developing countries, particularly in rural areas. Therefore, this study aimed at exploring the teachers' perceived barriers in implementing a nutrition education program for adolescents in rural Indonesian schools.

MATERIALS AND METHODS

Research design

A qualitative Participatory Action Research (PAR) design was applied in this study to explore the teachers' perceived barriers in experiencing the implementation of a nutrition education program for adolescents in rural Indonesian schools. PAR is part of a subset of action research, which is the "systematic collection and analysis of data for the purpose of taking action and making change by generating knowledge" (26). Also, previous qualitative studies showed the importance of PAR in encouraging capacity building and community involvement in the design, implementation, and dissemination of the research (27). Similarly, the current study is a qualitative aspect of a capacity building program aimed at enhancing the teacher's ability to provide nutrition education for adolescents. Hence, meeting similar characteristics as the above-mentioned use of PAR in previous studies. Moreover, Carr and Kemmis (1986) showed the important role of PAR in educational change, especially in developing teachers, as well as the teaching materials. Furthermore, Eliot (1991), cited in MacDonald, mentioned that activities such as educational research, curriculum development, teaching, and evaluation are the fundamental aspects of an action research process (27).

In this study, two of the three suggested data collection methods in PAR (27) were used, namely Focus Group Discussions (FGD) and participant observation. In general, FGD is "a socially-oriented process and a group interview which capitalizes on communication between research participants in order to generate data" (28). Focus Group Discussions (FGD) was selected as the primary method of data collection due to their common use in qualitative research aimed at gathering information from homogenous informants with similar backgrounds and experience (29). This method was conducted at the three participating schools, after a 5-month implementation program, at the closing hours to ensure a conducive environment. Prior to data collection, FGD facilitators

(researchers) consolidated on the use of its guidelines to ensure a similar understanding of the questions among all researchers. The duration of FGDs varied from one to one-and-a-half hours and the discussions were audio-recorded with verbal consent from the informants. Also, the FGD was facilitated by at least one researcher and one field assistant. The field assistant observed and created field notes throughout the session while the researcher facilitated the discussion and took notes occasionally.

Triangulation was applied (27,30) through teachers' observation and feedback from students involved in the program, to ensure the validity and accuracy of the results. Informants' observation is a common process in PAR (31,32). The method allows researchers to inquire information on the situation and social context in which both subjective and objective human behavior are recorded (26,33). The teacher-student interaction was observed during the scheduled NE session which was communicated by teachers to researchers, at least one week prior to the time. The teacher's use of the NE module and materials were observed, as well as the method of delivery, teaching strategies, and the accuracy of the information. Each school was observed at least twice during the program implementation period and feedbacks were given to the teachers for improvement purposes and to obtain information on perceived barriers. These were documented through pictures, videos, and field notes. Additionally, a brief, self-administered questionnaire was distributed to a sub-sample of students involved in the program (n=112) to understand the students' opinions on teachers' performance with message delivery and education tools used for the program. Students' understanding of the messages was also assessed and suggestions were taken for improving the program.

The research protocol was approved by the Health Research Ethics Committee of the University of Indonesia and Cipto Mangunkusumo Hospital (reference No. 451/UN2.F1/ETIK/2017) and the data collection was conducted from August – December 2017.

Subjects

Cihideung Ilir Village, Ciampea Sub District, Bogor Regency was purposely selected as the site for the Health and Nutrition Program for Adolescents held by the Southeast Asia Ministers of Education Organization Regional Center for Food and Nutrition (SEAMEO RECFON) and IPB University. The village is about 2.1 km away from the main campus of IPB University which was key to its inclusion in this research. In addition, since the village was chosen as the location for the SEAMEO STAR Village Program, a collaborative initiative of six SEAMEO Centres in Indonesia aimed at empowering the village in achieving economic, social and environmental development, hence, becoming a community learning center and a model for other villages (34). There are four vocational schools, one junior high school, and four elementary schools in the village. These schools provide education for 603 and 267 vocational and junior high school students respectively (35).

All the vocational and junior high schools in Cihideung Ilir Village were invited for the program, however, only three out of five schools agreed to participate, due to the management decision. The schools which gave consent and were actively involved in the program included one junior high school (JH) and two vocational high schools (VH-A and VH-B).

The total population sampling approach (36) was applied because the study was limited to teachers who participated in the Health and Nutrition Program for Adolescents in Cihideung Ilir Village. The sample population was 13 teachers involved in the program since the first training prior to program implementation until the end of the program. However, one of the teachers was absent during the FGD, leaving the study with a total of 12 informants composed of one principal from one of the vocational schools and 11 subject-specific teachers. Normally, FGD consists of seven to 12 informants with homogenous characteristics relevant to the focus of the study (32). However, smaller groups containing four to six informants are ideal for studies aiming to understand people's experiences through in-depth conversations (37). In this study, each FGD was attended by four informants who participated in the program since the beginning and received training. The age range was 25-45 years, university graduates (3-4 years), and contract teachers (under fixed-term employment agreement). The majority of the teachers were male with only three females, most of whom lived near the school. Most of them also teach in other schools, outside the Cihideung Ilir Village, to obtain additional income. The teachers taught various subjects, including Biology, Physics, Religion, Mathematics, Pharmaceutical Science, and Physical Education (PE).

Program Intervention

The Health and Nutrition Program for Adolescents aimed to provide health and nutrition education at schools through the capacity building of teachers. The teachers were trained and then asked to deliver 14 sessions of health and nutrition education in their respective schools for the students within five months. Each session lasted for 15 to 30 minutes, depending on the teacher's ability. Also, the teachers were allowed to develop the teaching plan which includes the topic, duration, and method of delivery. The participatory approach was encouraged in the design to promote ownership and a strong base for implementing the intervention within the community, as well as promoting its sustainability (38).

The participating teachers were selected by the principals based on the relevance of their administrative position or the subject taught. The research team trained

the teachers for 3 days (21 hours) on adolescent health and nutrition, nutritional status assessment, and methods of delivery based on a systematic module. The training method included teaching demonstration, micro-teaching, brainstorming, planning, and also FGD. The teachers were asked to create a schedule, describing the topic and method to be covered within the 14 sessions for five months. Additionally, pre- and post-tests were conducted to assess the effectiveness of the training. Then, as a way of complementing the training, all participants were added to a WhatsApp Group (WAG) to allow in-depth discussions on the topics, as well as to monitor and evaluate compliance of the teachers in performing the tasks as scheduled. WhatsApp provides technical, educational, and instructional advantages so that it is easy to access its learning materials any time, anywhere, and increase sense of belonging to the group (39).

The module used in the program was developed by SEAMEO RECFON through a participatory approach involving junior and senior high school teachers, as well as the Ministry of Education and Culture of the Republic of Indonesia and the Ministry of Health of the Republic of Indonesia to ensure the compliance of the module to the national dietary guidelines. Series of workshops were conducted in developing the module revolving around the major health problems among adolescents, health and nutrition information needed by students and teachers, and the delivery methods. These were then reviewed by experts and relevant school teachers for inputs and suggestions, which resulted in a 168-page manual, divided into two main sections, the handbook and lesson plan. The handbook was made up of information on adolescent health and nutrition, while the lesson plans were developed to assist the teachers in the delivery, made up of 25 ready-to-use activity manuals, and divided into three categories based on complexity. Through these levels of complexity, teachers could choose the appropriate method which best suits their capabilities and school resources. The activities categorized as "light" require less preparation and could be conducted within 15 minutes, such as short lectures and quiz. The "moderate" activities require at least a day preparation, such as a debate, eating breakfast together, and a discussion project on street food vendors. The "complex" activities require more support in terms of financial and human resources, and long-term preparation, such as a cooking competition. A detailed description of the module lesson plans is described in Table I.

Outcome Measures and Analysis

The key questions asked during the FGD included experiences from implementing nutrition education, perceived barriers, and program impact. The questions in Table II are used as a guideline for facilitators and further explored based on the answers of informants. The program's impact in this study adopts the definition of evaluations of program impact by Rennekamp and Arnold (2009) and Darger (2014) as cited by Olfert in 2018. This includes expanded motivation among the community, reinforced involvement of community members, positive behavior alterations, and increased program funding leading to short-term sustainability (40).

Results of the FGDs and observations were thematically analyzed from multiple sources of data. Audio recordings of FGDs were transcribed, while field notes of the assistant researcher and facilitator during the FGD were compared to validate and complement the findings. Observation data was documented through field notes, pictures, and videos. Qualitative data was then coded and categorized based on similarity which emerged as sub-themes and further themes. Relevant quotations from FGDs were used as part of the data display (41). Questionnaire feedback from students was analyzed using Office Excel software to generate percentages of each item. Results were used to complement the findings from the students' point of view.

RESULTS

Three themes and six subthemes (presented in parentheses) emerged from the teacher's experience in implementing nutrition education in the current study, namely 1) capacity of teachers (lack of training and lack of content knowledge), 2) school support (time constraints and lack of funding), and 3) external environment (unhealthy street vendors and parent's lack of nutrition awareness) as shown in Table III. The supporting quotes presented in the results section used initials to maintain the confidentiality of the informant's identity.

Capacity of Teachers

Lack of training and nutrition knowledge emerged as subthemes concerning the need for capacity building of teachers. All informants felt the benefit of receiving training before program implementation. However, lack of training was mentioned in two FGDs where informants expressed the need for training for other teachers yet to receive it, particularly in VH-A where a program that requires the participation of all teachers and students was initiated. A teacher from other schools emphasized the need for training and efforts for teachers whose educational background was not health-related.

Barriers are found in schools with different education backgrounds not in health. For example, vocational schools specializing in technology may not be able to carry out a program like this. More training is needed for them. –Mr. AR, teacher of VH-B

It is known that not all teachers teaching NE in this program have a nutritional or health-related background. The teachers teaching Biology and Physical Education

Table I: Topics Included in the Nutrition Education Module & Lesson Plans

Nurition and Health Education Module for Adolescents		
Chapter	**Sub Chapter**	
1. Adolescent Nutrition	Nutrition throughout the life cycle	
	Characteristics of adolescence	
	Nutrition requirements of adolescence	
2. Adoelscent Nutrition and Health Problems	Body image, diet, and eating disorders	
	Obesity	
	Anemia	
	Gastrointestinal disorders	
	Other health issues (food safety, smoking, lack of hygiene & sanitation), lack of physical activity	
3. Solutions to Adolescent Nutrition and Health Problems	Balanced Nutrition Guidelines	
	Role of school environment and family/ community	
Lesson Plans		
Level of Activity	**Topic**	**Recommended Method of Delivery**
Light	Characteristics of adolescents	Paired student interview asking the changes one has experienced before and after entering junior high school and reflect on physical and physchological changes. Emphasize that these changes require adequate nutrition in order to grow and develop optimally. (30 min)
	Eating disorders of adolescents	Interactive lecture addressing the common eating disorders. End the session with a fun quiz. (30 min)
	Smart without smoking	Interactive lecture addressing the danger of smoking. End the session with a fun quiz. (15 min)
	Clean lifestyle	Group pop quiz. Questions provided in the lesson plan. (30 min)
	Malnutrition in adolescents	Interactive lecture addressing the nutrient deficiencies among adolescents and how to prevent them. End the session with a fun quiz. (30 min)
	Physical activity	Physical activity guessing game. One volunteer is asked to demonstrate a physical activity (PA) using only gestures. The rest of the class guesses. The teacher summarizes at the end the importance of PA and emphasize that PA can be easily done in everyday life. (30 min)
	Fruit and vegetable consumption	Introducing their self using characteristics of a fruit or vegetable. End session with summary and eat fruit and vegetables together. (30 min)
	Anemia	Interactive lecture addressing the causes, impact, and prevention of anemia among adolescents. End the session with a fun quiz. (30 min)
	Caring our environment	Writing a letter to their selves on his/her role to care for the school environment. This letter is to be collected by the teachers and returned at the end of the semester for students to reflect upon. Teachers emphasize the important role of students in caring for the environment and the negative impact otherwise. (30 min).
	Let's be smart consumers	Students are asked to bring a packaged food with nutrition facts. They are taught how to read the nutrition fact and its importance. (30 min).
Moderate	Let's eat breakfast	Debate. Students are divided into two groups. 3 person each group will participate in the debate arguing whether or not breakfast is needed (60 min).
	Balanced nutrition	Students are asked to bring lunch boxes with a healthy menu. Lunch boxes are reviewed and asked for feedback what should be improved to become a balanced nutritious menu. Teachers also discuss the benefit of food groups of a balanced nutritious menu (30-45 min, recommended once a month).
	Balanced nutrition messages in my school	Students are divided into groups of 4 and asked to creatively design nutrition messages to be put on boards in the school (30-45 min, recommended once a month). This activity can also be given to a student organization to routinely provide nutriton education messages on the school display area.
	Monitoring nutrition status	Nutrition status assessment. Student organizations can be taught how to measure nutrition status. They can be given the responsibility to conduct nutrition status assessment once every three months. Results of the measurement can be discussed in the class. Teachers emphasize on the importance of routine monitoring.
	Physical activity	Students are divided into small groups of 6 where they take turns interviewing each other on their activities the day before since they wake up until they go to bed. Teachers point out activities that are healthy and less healthy for the body and also emphasize the importance of routine physical activity.
	Anemia	Teachers invite a parent who has a medical, health, nutrition or public health background to deliver nutrition messages on anemia.
	Clean environment and self care	Students are divided into small groups according to school area to collect rubbish. Teachers encourage to separate rubish into two categories, organic and inorganic, followed by demonstration of propper handwashing.
	Environment free of smoke	Students create educational tools and conduct a no smoking campaign around the school.
	Smart consumers	Students in groups of 5 plan a balanced nutrition meal with a budget of USD 3.5. Students buy their own groceries and ask to explain the health benefit of each item. If the school has cooking facilties, students continue to cook their planned meal and present it to the judges (minimum 3 teachers).
	Food diversity	Students find information on the nutritional content and benefit of vegetables and fruits that are planted at school. Teacher explains the importance of a varied diet.
Complex	Culinary nutrition	Cooking demonstration and creating simple dishes, such as sandwhiches and fruit/ vegetable salad. Teachers emphasize that delicous and nutritions meals do not need to be expensive.
	Food safety	Interview and observation of street food vendors. Students identify unsafe food ingredients and procedures.
	Nutrition education for the school environment	Students plan and conduct nutrition education session for the school's surrounding community, such as household wives, kindergarten schools, street vendors, etc.
	Balanced nutrition	Students plan and conduct a Healthy Living Festival where they sell homemade nutritious food products. They also create flyers and promotional materials to advertise their food. The food should be based on the balanced nutrition principles.
	Food diversity	Students cook vegetables that are grown in the school garden. Vegetables must be planted one or two months before the activity.

Table II: Focus Group Discussion Question Guideline

No	Key Questions
1	How many times have you conducted nutrition education sessions and how long is the duration of each sessions?
2	How do you feel about providing nutrition education in school?
3	During the implementation, what are the barriers that you face?
4	What do you think are the future barriers if this program were to continue?
5	What are the supporting factors throughout this program?
6	Will you continue to deliver nutrition education after the program is finished?
7	Do you have any suggestions on how to improve this program?

have an advantage as they already understood the basic concepts of nutrition. However, teachers teaching Religion, Physics, Mathematics, and Pharmaceutical Science need more effort to understand the topics despite the training already received prior to program implementation.

Lack of knowledge in nutrition was the most common barrier, mentioned by six informants. The teachers expressed difficulty in delivering certain nutrition concepts such as portion size, nutritional facts, and the concept of calorie-counting, with their limited understanding of the topic.

Students didn't understand how much 2,000 kcal as written in the label is and we couldn't help with it. –Mr. AD, teacher of JH-A

Some teachers felt that these topics should be made easier for teachers, indicating suggestions for further improvement of the module. Another teacher suggested that the research team should directly deliver NE to students, rather than the teachers, showing a lack of confidence in delivering it. This was mentioned in a playful manner on how students will listen more to researchers compared to teachers. The need to expand understanding of nutrition knowledge, by involving other teachers, was also mentioned to increase the capacity of other teachers.

Table III: The main themes that were identified as barriers in implementing NE

Themes	Subthemes	Supporting quotes
Capacity of teachers	Lack of training	"Barriers are found in schools with different education backgrounds not in health. For example, vocational schools specializing in technology may not be able to carry out a program like this. More training is needed for them."–Mr. AR, teacher of VH-B
		"It is good that there was a training before the program, even though there were some shortcommings during the implementation. Not all teachers understand about nutrition"-Mr.AO, teacher of VH-A.
	Lack of nutrition knowledge	"Student didn't understand how much 2,000 kcal as written in the label is and we couldn't help with it." –Mr. AD, teacher of JH-A
		"Students didn't understand about the correct portion size they should consume." – Mrs. AM, teacher of JH-A
		"We could not understand some of the material. It should be made simpler for the teachers."–Mr. AR, teacher of VH-B
		"It's different when students hear it from us (the teachers). We suggest how if the research team come sometimes to our school and directly give nutrition education to our students."–Mrs. AM, teacher of JH-A
		"Not all teachers understand nutrition. We need to have WhatsApp Group with other teachers in other schools to share information regarding the module." –Mr. BK, teacher of VH-A
School support	Time constraints	"Time management is a problem. Because this nutrition education is not part of the curriculum, the topics need to be inserted and adjusted to the existing teaching and learning activity schedule."–Mr. AR, teacher of VH-B
		"Activities in the module are too long. We need lesson plans that can be done in a short period of time," – Mrs. SH, teacher of VH-B
		"We cannot conduct the activities exactly the same as in the module because lack of time and must be adjusted to what the students are currently studying." –Mrs. MA, teacher of VH-A
	Lack of funding	"Not all the topics could be delivered because it requires materials which needs to be bought outside of the school"– Mr. AR, teacher of VH-B
		"Tools are needed to help explaining the material, such as human organ anatomy models or educational toys." –Mr. AS, teacher of JH-A
External environment	Unhealthy street vendors	"The challenge is the available (unhealthy) snacks that haven't changed, so they (students) are forced to buy what is there. But there are some who are triggered to bring food from home. The school also provided free drinking water facility 2 gallons per day. This good behavior is also beginning to spread to the boys."–Mrs. MA, teacher of VH-A
		"We cannot prevent vendors in the canteen to sell these (unhealthy) food. Otherwise they will lose income. Some students come to school without eating breakfast and they choose to buy the foods in the canteen" – Mr. B, teacher of VH-B
	Parents' lack of nutrition awareness	"From the family of students, the important thing is that the children eat, but they don't care about whether their nutrients are fulfilled or not"–Mr. AD, teacher of JH-A

School Support

School support refers to the principal's commitment to establishing a supportive environment where NE can be delivered accordingly. Two subthemes emerged from the school support theme, namely, time constraints, and lack of funding. The issue of time constraints was mentioned in all three FGDs, emphasizing the fact that nutrition education is not part of the existing curriculum and therefore can only be conducted with limited time.

Time management is a problem. Because this nutrition education is not part of the curriculum, the topics need to be inserted and adjusted to the existing teaching and learning activity schedule.–Mr. AR, teacher of VH-B

Two teachers from different schools suggested improving the activities in the module to be shorter in duration due to time limitations.

Lack of funding was mentioned in two FGDs concerning the provision of educational tools and materials that the teachers thought was important to be used during NE.

Tools are needed to help explain the material, such as human organ anatomy models or educational toys –Mr. AS, teacher of JH-A

Despite being provided several choices of NE activities in the Health and Nutrition module, including activities that do not require additional materials, teachers still felt the need to provide additional learning materials to enhance understanding of students.

External Environment

The teachers acknowledged the presence of uncontrollable external factors affecting students' eating behavior which might be out of their reach, such as the street food vendors near the school. It was confirmed through observation, that many street food vendors sell unhealthy and unsafe snacks.

We cannot prevent vendors in the canteen to sell these (unhealthy) food. Otherwise, they will lose income. Some students come to school without eating breakfast and they choose to buy the foods in the canteen – Mr. B, teacher of VH-B

Teachers expressed their concern that despite delivering NE at school, as long as there are vendors who still provide access to unhealthy food, students will be forced to buy what is available.

Another identified barrier was the lack of parents' involvement in providing balanced nutritious meals at home. One of the teachers mentioned that students' nutritional practices are highly influenced by their eating habits at home, due to parents' lack of nutritional knowledge as perceived by the teachers.

From the family of students (point of view), the important thing is that the children eat, but they don't care about whether their nutrients are fulfilled or not – Mr. AD, teacher of JH-A

Program Impact

All three participating schools expressed positive opinions towards the program. Many teachers shared that this was their first experience learning about nutrition. They felt more confident to deliver NE to students and even more motivated when students responded with enthusiasm.

(I) gained knowledge. After given training, I am more confident in explaining (nutrition education) to the students. Students' enthusiasm is really good. They have requested to discuss nutrition topics after certain subjects. Girls are more enthusiastic, especially on the topic of nutrition during the child-bearing age. – Mr.GD, teacher of VH-A

Another teacher supported the program to be continued regularly because nutrition was thought to be associated with the health-related subjects within the school curriculum.

The student's positive response to the program was repeatedly mentioned in all FGDs. This finding was also confirmed through observation where students actively responded during NE sessions and also from the result of feedback questionnaires distributed to students. As many of 87.5% of the students confirmed to receive NE from teachers at school. The majority of the students (77.5%) claimed that the method of delivery was interesting and enjoyed receiving NE in school (86.5%). Among the nine alternative methods of delivery suggested in the module, students were most enthusiast when teachers brought real food or beverages to demonstrate nutrition messages (26.7%). They also enjoyed NE in the form of competitive games (15.2%).

Our observations show that in one of the schools (VH-A) where the principal played a prominent role in the program, teachers were motivated to modify and adopt new programs related to health and nutrition. This was also expressed by one of the teachers that supported the finding.

This is a great program. Moreover, there is full support from the principal which turns out to be important. – Mrs. MA, teacher from VH-A

Inspired from the program, a breakfast day was established, which requires all of the academic community (teachers, staff, and students) to bring healthy breakfast from home once a month during the first week of every month. Students were encouraged to bring food from home to minimize snacking of unhealthy food from

vendors around the school.

We will continue (delivering NE) during the girl's session every Friday. Moreover not all the topics in the module has been delivered – Mrs. MA, teacher from VH-A

The breakfast together program will be continued. Maybe if there is an event where we eat together, we will insert nutrition messages. We can also make healthy food and sell them. - Mr. AO, teacher from VH-A

The school also provided drinking water in public dispensers and encouraged students to bring their own water bottles. The teachers mentioned that this program will be continued and considered to be expanded to involve other teachers that have not received training. In terms of funding, the principal has also planned to endorse this program to the school board to seek funding in the next academic year.

In other schools, where the involvement of the principal was less, teachers were personally willing to continue delivering NE in their classrooms. However, follow-up plans to expand or endorse this program to a higher level at the school board was not mentioned.

DISCUSSION

This study explored the teachers' perceived barriers to implementing a nutrition education program for adolescents in rural Indonesian schools. Three main themes emerged from the study, which includes 1) capacity of teachers, 2) school support and 3) external environment. Teachers also expressed advantages from the program, both personally and institutionally, which provides valuable insights on how such programs could be sustained and adopted in other schools.

In developing countries where nutrition and health topics are not mandated by the government, there are many challenges against the successful delivery of NE in schools due to a lack of support systems (42). One of the main barriers of NE emerged in this study was related to the capacity of teachers. It was found that lack of training and lack of nutrition knowledge was present among the teachers despite having received training and supervision from researchers. Especially for teachers who teach unrelated subjects, such as physics, mathematics, religion, and pharmaceutical science. Teachers of these subjects need more time to understand the module. For some teachers, this issue is discouraging and is one of the reasons why they do not implement the module consistently. This finding was similar to previous studies who also found that unrelated subject matter was a common barrier. Hence, emphasizing the need to ensure technical capabilities, improve self-efficacy, empowerment, and skill development of teachers responsible for facilitating learning, will potentially contribute to health behavior change of the students (42,43).

In terms of school support, time availability and funding were the major concerns in the implementation of the NE program. One of the common barriers faced by teachers was lack of time management to cover both the core subjects and nutrition education (particularly NE topics that require preparation) in their classes. On a daily basis, teachers have to implement the national curriculum and also conduct administration duties. Therefore, delivering additional nutrition and health messages becomes a burden for those who do not have a strong commitment towards the program because it requires more effort to prepare and understand the messages. Moreover, the previously planned NE schedule was sometimes not applicable to the school's schedule, hence teachers must find time to insert the messages in between classes. Previous studies have also shown that time management was commonly perceived as a barrier to informal learning activities (23,44). Even in developed countries such as in the United States, where teachers are more familiar with nutrition education programs, teachers feel that prioritization of the main subjects limited time to deliver nutrition education (22), indicating a lack of attention towards nutrition-related subjects.

This is also the case for lack of financial support which becomes an issue when schools do not commit to investing in NE programs. In previous studies, the issue of financial support was associated with incentives for classroom teachers or nutritionists and dieticians (23,45). However, in this study, lack of financial support is related to technical aspects of implementation that requires funding. Although the module includes lesson plans and print-outs for direct use to minimize expenditure for materials and equipments, some teachers prefer to bring food for demonstration and develop their own tools to increase understanding of students. In VH-A, where the principal fully supported the program, expenditures were borne by the school. Meanwhile, in other schools, teachers voluntarily used their personal money to purchase food and items needed for NE. Even though such actions show good intentions of committed teachers, however, it is less likely to be sustainable in the long-term.

The issue of incentives was not captured in our findings, unlike other studies, because the program relied on the concept of community empowerment. Incentives bring risks to the sustainability of the program because it sets a high standard and demand from receivers (46). Once the program no longer provides incentives, it is questionable whether teachers will continue the program voluntarily. However, acknowledging that the delivery of NE is a new task for these teachers, funding endorsements should be made at higher-level decision-makers, such

as the School Board or District Education Offices.

The external environment influencing food choice is inevitable. Studies acknowledging the importance of the food environment (both at school and home) emphasizes that NE will have a limited impact on students' dietary behavior unless it is reinforced what is being taught in school (23,47). In the current study, most food vendors outside the schools sell unhealthy and less nutritious foods. These schools do not have complete authority to ensure food safety outside. According to FAO, NE which is aimed at providing healthier foods is seldom practiced because schools do not have access to various choices of healthy food. The school canteen is the key food environment with a significant role in promoting and creating a healthy eating culture in the school (48). Hence, the canteen could be extended beyond the school environment, to influence food choices within the family and community, thereby strengthening the social and multicultural aspects of eating (49). Therefore, the current study suggests the need for schools to partner with local health authorities to ensure a safe food environment around the school premises.

Lessons Learned

Understanding the various barriers that teachers experienced during the implementation of a Health and Nutrition Program provides insight on what could be improved and anticipated in future programs. Such aspects include 1) establishing a strong commitment of principals, 2) inclusion of street-food vendors and parents, and 3) ensuring adequate training of teachers.

The implementation of the NE program in schools depends on several factors. Among others that were discovered in the study was the school's support through the commitment of the principal (47). The success of NE in some schools was mainly because of the involvement of the school principal in the education process and his/her ability to delegate tasks related to this program to the school teachers. In one of the schools where the principal is fully aware of the importance of nutrition and health for their school, they were able to assign more teachers to participate in the program. Principals played an important role to maintain the motivation of teachers and to create a support system through the establishment of regulations and reinforcements. This support system enables teachers to make enhancements beyond the program and adopt the activities in the learning environment, hence benefiting both students and teachers. While in schools where teachers receive less support from their principals led to a lack of distribution of resources implementing NE. Implementation was limited to teachers who are exposed to health and nutrition training.

This kind of support is identified as "an environmental component" in a review paper by Contento, where nutrition educators cooperate with policymakers and related stakeholders to promote environmental supports for action. Policymakers at the school level include the school principal with whom school policies and regulations may be fine-tuned to foster good nutritional practices of the students (50). Hence, sufficient time must be allocated for advocacy targeting principals and the school board before program implementation. Higher-level advocacy should also include involvement and endorsement from District Education and Health Offices to provide a form of enforcement and support to ensure principals' participation (47).

This program particularly focused on increasing the capacity of teachers to deliver NE as the first step to introduce nutrition at schools which are aimed at increased awareness and program ownership. The fact that teachers were able to identify the external factors preventing desired behavior change of adolescents indicated a higher level of understanding and potential action plan that can be continued by the school. Provision of nutrition and health training as well as food safety training for food vendors is a potential program that can be organized by the school with support from partner institutions and also the District Health Office.

The inclusion of parents through existing channels should also be considered in NE programs to encourage the adoption of health and nutrition practices at home. In the participating schools, a parent-teacher board exists to facilitate communication between teachers and parents. Schools and program implementers should explore other potential channels to engage parents in NE programs. The involvement of parents showed beneficial impacts on behavior change in previous studies conducted in developing countries. Particularly when take-home messages in the form of reading materials such as posters or leaflets were used in the program (18).

This study also found that despite the rigorous effort in developing a useful module for teachers, some teachers still felt a lack of confidence and understanding on certain topics, indicating that the program may not be sufficient to meet the above-mentioned needs of all participating teachers, particularly those with heterogeneous background knowledge unrelated to health and nutrition. It is suggested that a longer duration of training should be considered and continuously conducted to support the needs and motivation of teachers. The various basic knowledge on the health and nutrition of teachers should be carefully taken into consideration, whether the grouping of teachers based on related subjects is beneficial. The study also suggests the need to identify more sustainable partner institutions to provide post-training coaching and assistance for the teachers in implementing nutrition education as prescribed to appropriately address their barriers. Continuous training and discussion with fellow teachers and the use of open distance learning technologies

need to be further explored to increase the likelihood of program sustainability.

Strengths and Limitation

This study provides comprehensive insights into the barriers of a nutrition education program faced in a rural area, with limited access to information and a high level of poverty. Since the majority of areas in Indonesia are rural, the results of this study may represent education problems faced in similar conditions. Furthermore, the design of this study (PAR) enables researchers to gather useful information based on the actual experiences of teachers after the implementation of NE in a timely manner, hence capturing the experiences of teachers during the preparation stage, implementation, and also the planning of future programs. Also, the different levels of involvement of the school's principal provided a good understanding of the various potential responses of schools and how it influences the program impact.

However, a limitation of this study was the fact that the teachers involved in the program were limited to only a few from each participating school. They were appointed by the principals based on different considerations, hence leading to the heterogeneous subject background, which may affect the findings from this study. We have no information on how other teachers would respond to the program if they were to be exposed to the health and nutrition training, which may differ in terms of the barriers in the capacity building found in this study. Nevertheless, the variability of teachers' responses from the three participating schools was found to be sufficient, as some degree of saturation was achieved from the data collection process.

CONCLUSION

This study highlights the need for schools and program implementers to identify potential barriers prior to commencing NE and also strengthen opportunities within it. The barriers found in this study emphasizes the need for advocacy to obtain schools' full support, adequate training to ensure teachers' capacity in delivering NE, and also the inclusion of food vendors and parents in such programs. These findings provide valuable information for the development of NE programs, especially those specifically targeting rural schools in developing countries. Further qualitative and quantitative studies are suggested to confirm the findings from this study, involving a larger number of informants and also different settings such as in the urban population.

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REFERENCES

1. Soliman A, Sanctis V De, Elalaily R. Nutrition and Pubertal Development. Indan J Endocrinol Metab [Internet]. 2014;Nov(18(Suppl 1)):S39–47. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4266867/
2. Rodrigues PRM, Luiz RR, Monteiro LS, Ferreira MG, Goncalves-Silva RMV. Adolescents' unhealthy eating habits are associated with meal skipping. Nutrition [Internet]. 2017;42(Oktober 2017):114–20. Available from: https://www.sciencedirect.com/science/article/abs/pii/S0899900717300655?via%3Dihub
3. Bibiloni MDM, Pich J, Pons A, Tur JA. Body image and eating patterns among adolescents. BMC Public Health. 2013;13(1).
4. Vikraman S, Fryar CD, Ogden CL. Caloric Intake From Fast Food Among Children and Adolescents in the United States, 2011–2012 Key findings Data from the National Health and Nutrition Examination Survey. NCHS Data Brief. 2015;213(September 2015):1–8.
5. National Institute of Health Research and Development Republic of Indonesia, Institute IHRI. Basic Health Survey. Jakarta; 2018.
6. Savage A, Februhartanty J, Worsley A. Adolescent women as a key target population for community nutrition education programs in Indonesia. Asia Pac J Clin Nutr. 2017;26(3):484–93.
7. McAleese JD, Rankin LL. Garden-Based Nutrition Education Affects Fruit and Vegetable Consumption in Sixth-Grade Adolescents. J Am Diet Assoc. 2007;107(4):662–5.
8. Wang D, Stewart D, Chang C, Shi Y, Chang Chun, Shi Y, et al. Effect of a school-based nutrition education program on adolescents' nutrition-related knowledge, attitudes and behaviour in rural areas of China. Environ Health Prev Med [Internet]. 2015 Jul 1 [cited 2019 Aug 27];20(4):271–8. Available from: http://dx.doi.org/10.1007/s12199-015-0456-4
9. Hossain M, Choudhury N, Abdullah KAB, Mondal P, Jackson AA, Walson J, et al. Evidence-based approaches to childhood stunting in low and middle income countries: a systematic review. Arch Dis Child. 2017;102(10):903–9.
10. Beckwith S, Cooper M, Goesch H, MacKinnon G. Where do we currently stand? [Internet]. 2010. Available from: http://www.farmtoschool.org/learn.
11. Tanaka N, Miyoshi M. School lunch program for health promotion among children in Japan. Asia Pac J Clin Nutr. 2012;21(1):155–8.
12. Februhartanty J. Nutrition education: it has never been an easy case for Indonesia. Food Nutr Bull [Internet]. 2005;June(26(2 Suppl 2)):S267-74. Available from: https://www.ncbi.nlm.nih.gov/pubmed/16075577

13. Adhistiana R, Khomsan A, Amalia L. Identifikasi Muatan Gizi Dalam Mata Pelajaran Di Sekolah Dasar Bantarjati 5 Bogor. J Gizi dan Pangan. 2009;4(3):151.
14. Sungkowo S, Budi S, Siti M. Intervensi Pengayaan Pengetahuan Pangan dan Gizi pada Muatan Lokal untuk Sekolah Menengah Pertama di Kabupaten Lampung Barat. J Gizi dan Pangan. 2008;3(3):156–66.
15. Shahar S, Adznam SN, Rahman SA, Yusoff NAM, Yassin Z, Arshad F, et al. Development and analysis of acceptance of a nutrition education package among a rural elderly population: An action research study. BMC Geriatr [Internet]. 2012;12(1):1. Available from: BMC Geriatrics
16. Ybarra ML, Emenyonu N, Nansera D, Kiwanuka J, Bangsberg DR. Health information seeking among Mbararan adolescents : results from the Uganda Media and You survey. Health Educ Res. 2008;23(2):249–58.
17. McCalla JR, Juarez CL, Williams LE, Brown J, Chipungu K, Saab PG. Promoting Healthy Lifestyle Behaviors: The Heart Smart Discussion Activity. J Sch Heal. 2012;82(12):572–6.
18. Sherman J, Muehlhoff E. Developing a Nutrition and Health Education Program for Primary Schools in Zambia. J Nutr Educ Behav. 2007;39:335–42.
19. Rachman PH, Mauludyani AV, Ekawidyani KR. Effectiveness of nutrition and health education module on acceptance, nutritional knowledge, attitude, practice and nutritional status of female adolescents in Ciampea Sub District Bogor. Final Report. Jakarta: SEAMEO Regional Center for Food and Nutrition; 2017. Contract No. 303/PPK/SEAMEO RECFON/III/2017.
20. Febriana M, Nurkamto J, Rochsantiningsih D, Muhtia A. Teaching in Rural Indonesian Schools: Teachers' Challenges. Int J Multicult Multireligious Underst. 2018;5(5):11–20.
21. Sandjaja S, Budiman B, Harahap H, Ernawati F, Soekatri M, Widodo Y, et al. Food consumption and nutritional and biochemical status of 0·5–12-year-old Indonesian children: the SEANUTS study. Br J Nutr. 2013;110(S3):S11–20.
22. Hall E, Chai W, Albrecht JA. A qualitative phenomenological exploration of teachers' experience with nutrition education. Am J Heal Educ. 2016;47(3):136–48.
23. Perera T, Frei S, Frei B, Wong SS, Bobe G. Improving Nutrition Education in U.S. Elementary Schools: Challenges and Opportunities. J Educ Pract [Internet]. 2015;6(30):41–50. Available from: http://search.proquest.com/docview/1773216959?accountid=13963
24. Perikkou A, Kokkinou E, Panagiotakos DB, Yannakoulia M. Teachers' readiness to implement nutrition education programs: Beliefs, attitudes, and barriers. J Res Child Educ. 2015;29(2):202–11.
25. Jшrgensen TS, Krшlner R, Aarestrup AK, Tjшrnhшj-Thomsen T, Due P, Rasmussen M. Barriers and facilitators for teachers' implementation of the curricular component of the boost intervention targeting adolescents' fruit and vegetable intake. J Nutr Educ Behav. 2014;46(5):e1–8.
26. Gillis A, Jackson W. Research methods for nurses: Methods and interpretation. Philadelphia, PA: F.A. Davis Company; 2002.
27. Macdonald C. Understanding Participatory Action Research: A Qualitative Research Methodology Option. Can J Action Res. 2012;13(2):34–50.
28. Kitzinger J. Qualitative Research: Introducing Focus Groups. Br Med J. 1995;311:299–302.
29. O.Nyumba T, Wilson K, Derrick CJ, Mukherjee N. The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods Ecol Evol. 2018;9(1):20–32.
30. Mertens DM. Ethical use of qualitative data and findings. In: Flick U, editor. The SAGE Handbook of Qualitative Data Analysis. London: SAGE Publications Ltd; 2014. p. 510–22.
31. Dargie C. Observation in Political Research: A Qualitative Approach. Politics. 2002;18(1).
32. Marshall C, Rossman GB. Designing qualitative research. 4th Editio. Newbury Park, CA: SAGE Publications; 2006.
33. Mulhall A. In the field: notes on observation in qualitative research. J Adv Nurs. 2003;41(3).
34. SEAMEO Secretariat. Action Agenda for the SEAMEO 7 Priority Areas. Bangkok; 2018.
35. Statistics BB of. Ciampea Subdistrict in Figures 2019. Bogor; 2019.
36. Rapley T. Sampling strategies in qualitative research. In: Uwe F, editor. The SAGE Handbook of Qualitative Data Analysis. London: SAGE Publications Ltd; 2014. p. 49–63.
37. Krueger RA, Casey MA. Participants in a Focus Group. In: Stewart DW, Shamdasani PN, editors. Focus Groups: A Practical Guide for Applied Research [Internet]. Third Edit. SAGE Publications Ltd; 2015. p. 63–84. Available from: https://www.sagepub.com/sites/default/files/upm-binaries/24056_Chapter4.pdf
38. Rabinowitz P. Participatory Approaches to Planning Community Interventions [Internet]. Community Tool Box. 2016 [cited 2020 May 3]. Available from: https://ctb.ku.edu/en/table-of-contents/analyze/where-to-start/participatory-approaches/main
39. Gon S, Rawekar A. Effectivity of E-Learning through Whatsapp as a Teaching Learning Tool. MVP J Med Sci. 2017;4(June):19–25.
40. Olfert M, Hagedorn RL, White JA, Baker BA, Colby SE, Franzen-Castle L, et al. An Impact Mapping Method to Generate Robust Qualitative Evaluation of Community-Based Research Programs for Youth and Adults. Methods Protoc. 2018;1(3):25.
41. Reichertz J. Induction, Deduction and Abduction.

In: Flick U, editor. The SAGE Handbook of Qualitative Data Analysis. London: SAGE Publications Ltd; 2014. p. 123–35.
42. McNulty J. Challenges and Issues in Nutrition Education [Internet]. Nutrition Education and Consumer Awareness Group, Food and Agriculture Organization of the United Nations. 2013. Available from: www.fao.org/ag/humannutrition/nutritioneducation/en/
43. Jones AM, Zidenberg-Cherr S. Exploring Nutrition Education Resources and Barriers, and Nutrition Knowledge in Teachers in California. J Nutr Educ Behav [Internet]. 2015 Mar 1;47(2):162–9. Available from: https://doi.org/10.1016/j.jneb.2014.06.011
44. Lohman MC. Factors influencing teachers' engagement in informal learning activities. J Work Learn. 2006;
45. Lee J, Hong Y. Identifying barriers to the implementation of nutrition education in South Korea. Asia Pac J Clin Nutr. 2015;24(3):533–9.
46. Linn JF. Incentives and Accountability for Scalling Up. In: Chandy L, Hosono A, Kharas H, Linn J, editors. Getting to Scale: How to Bring Development Solutions to Millions of Poor People. Washington DC: Brookings Institution Press; 2013.
47. Qian L, Newman IM, Yuen LW, Du W, Shell DF. Effects of a comprehensive nutrition education programme to change grade 4 primary-school students' eating behaviours in China. Public Health Nutr. 2019;22(5):903–11.
48. Meiyetriani E, Februhartanty J, Iswarawanti DN. A Situational Analysis of a Healthy School Canteen Development Program: Lessons Learned from a Selected Group of Primary Schools in Jakarta, Indonesia. Southeast Asian J Trop Med Public Heal. 2019;50(No. 3):577–88.
49. Department of Education and Training. Go for your life [Internet]. Melbourne: Healthy Canteen Kit: Student Learning Division, Office of Learning and Teaching; 2006. Available from: www.education.vic.gov.au
50. Contento IR. Nutrition education : linking research, theory , and practice. Asia Pac J Clin Nutr. 2008;17(December 2007):176–9.