

Nutrition Education for Affordable, Nutritious and Tasty Meals (NEAT) in Early Childhood Education (ECE), Depok, West Java, Indonesia



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ABSTRACT

Introduction: During the pre-school period in Early Childhood Education (ECE), where children spend approximately 3-4 hours a day, there is a critical opportunity to instill balanced eating habits despite low knowledge and attitudes about nutrition in daily meals. The Nutrition Education for Affordable, Nutritious and Tasty Meals (NEAT) programme aims to improve the knowledge, attitudes, and skills of teachers, parents, and students in providing nutritious, varied, tasty, and economical healthy meals.

Methods: This programme was held in PAUD Baitussalam, Depok, West Java, Indonesia, involving the entire school community as participants, consisting of principals, teachers, students, and parents. The socialisation and training of teachers and parents was carried out through Zoom Meetings with interactive discussion methods using electronic paperback media. In addition, the programme was carried out offline in two activities. Firstly, for parents with a healthy-economical meal education and competition, and secondly, for students with a game method using a snake ladder mat and stickers.

Results: The results showed that the nutritional knowledge and attitudes towards healthy and economical eating among teachers, parents, and students improved after the programme. The challenge of this programme is to fit in with the schedules of the parents and to keep the students focused during the activities, but the enthusiasm of the participants was relatively high.

Conclusion: In conclusion, this programme improved nutritional knowledge and attitudes, despite scheduling challenges, and demonstrated high levels of participant enthusiasm and engagement.

Keywords: Affordable; balanced nutrition; economical; meals; pre-school.

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INTRODUCTION

Early childhood is an important developmental period for individuals. Children experience significant physical and mental development and growth in the early years. They react to and process the things they receive at this age quickly. Therefore, what children receive in their early years will be the foundation for their later lives.^{1,2}

Balanced nutrition must be implemented from early childhood, as this is a crucial developmental period that significantly influences growth and determines the quality of life in later years.³ Balanced nutrition is a daily diet

that contains nutrients in the types and amounts appropriate for the body's needs, considering the principles of diversity, physical activity, hygiene, and ideal body weight. A balanced diet is consuming food to fulfill the body's nutritional needs. Other foods can satisfy the lack of nutrients in one food in a balanced diet. Therefore, a balanced diet with various foods is necessary for nutritional adequacy.⁴

Food diversity is significant as a source of energy, namely cereals and tubers, as a source of regulating substances, namely vegetables and fruits, and as a source of building substances, namely legumes, animal foods, and their processed products.⁵ The concept of child health

is closely related to the food consumed. Food consumed in excess or in less than hygienic conditions will cause health problems. Children who are accustomed to consuming less clean food will be susceptible to disease, which results in the condition of the child's immune system. In the long term, consuming foods containing preservatives and additives will cause damage to body tissues, resulting in impaired health.⁶

Schools are a powerful tool for delivering nutrition education, including Early Childhood Education (ECE). This type of education promotes the growth and development of children as a whole or emphasises the development of all aspects

of the child's personality.⁷ Therefore, early childhood education provides opportunities for children to develop their personality and abilities fully. Pre-school children generally spend about 3-4 hours a day at school, and play an important role in instilling healthy habits in children.⁸ The problem related to nutrition in PAUD Baitussalam, Depok is the low knowledge and awareness of students, teachers, and parents, especially mothers, about the importance of implementing balanced nutrition in children's daily diet. Education on the importance of healthy food consumption with balanced nutrition principles in early childhood is needed. Therefore, to overcome this problem, it is necessary to conduct a Healthy Snacks Nutrition Education program for PAUD Baitussalam, Depok students to stimulate children's interest in food with balanced nutrition.

Nutrition education in schools can be an effective alternative for parents, children, and teachers to prevent early childhood nutrition problems, including stunting. Healthy snacks do not have to be expensive to prepare, making them an easy, enjoyable, and affordable habit to adopt. Children's school meals can be packed at an affordable cost, depending on the economic ability or income of the parents. The Nutrition Education Programme for Affordable, Nutritious, and Tasty Food (NEAT) can solve the problems faced by partners, namely PAUD Baitussalam and Depok. This program aims to improve the knowledge, attitudes, and skills of students, teachers, and parents by providing healthy food menus that are nutritious, varied, tasty, and economical.

METHOD

Place, time, and target

The Nutrition Education for Affordable, Nutritious and Tasty Meals (NEAT) programme in partnership with PAUD Baitussalam, Depok, will target students, teachers, and parents in April-May 2023. The programme targets all school officials, namely the school principal, teachers, and parent school committee representatives.

About PAUD Baitussalam

PAUD Baitussalam is an early childhood education institution located at



Figure 1. Learning atmosphere at PAUD Baitussalam.



Figure 2. The media used in the programme.

Baitussalam Mosque, Puri Depok Mas, Pancoran Mas Village, Pancoran Mas District, Depok City, West Java. Located in the residential area of Puri Depok Mas, this institution carries the concept of environment-based education by using learning resources around (Figure 1). PAUD Baitussalam recognises that the education of children requires the involvement of the wider community, and therefore invites all residents to participate in the educational process.

PAUD Baitussalam provides services to Playgroups and Kindergarten Group A, aged 3-4 years. The number of students in April 2023 reached 23 children. The educational concepts applied include natural, holistic, mosque, and exemplary education. The learning model used centers, where children interact with teaching materials, peers, and educators, as well as learning methods such as demonstrations, field trips, playing, storytelling, and singing, which can be seen in Figure 1. The daily schedule is adjusted to the needs of the children, with a duration of two hours for Playgroups and three hours for Kindergarten Group A. The vision of PAUD Baitussalam is

to realize an early generation that grows and develops according to nature, has noble morals, and has a caring and environmentally conscious perspective.

PAUD Baitussalam also applies an integrative holistic approach by collaborating with Posyandu cadres, family welfare and empowerment program, majelis taklim, neighbourhood association, community health center, and local community leaders. This collaboration aims to fulfill children's fundamental rights, namely the right to life, the right to grow and develop, protection, and participation. Routine programs include "Barter Yuk," which aims to extend the life of goods, activities to care for plants or animals to bring children closer to God's creation, and "Jelajah Alam," which invites children to interact with the surrounding nature. Learning at PAUD Baitussalam is also structured based on themes derived from verses of the Kauniyah Al-Qur'an as a medium to bring students closer to the Creator, Allah SWT.

Programme design and media

The programme consisted of several activities such as (1) socialisation to

the NEAT programme, (2) nutrition education on nutritious and varied, tasty and economical healthy meal menus, (3) practice in preparing nutritious and varied, tasty and economical healthy meal menus through meals creation competition.

This activity is designed to provide partners with real information about nutritious, varied, delicious, and economical healthy food menus so that it can become an integrated and sustainable program. As can be seen in Figure 2, the media used in this series of activities are pocketbooks, snake ladder mats, dice, and stickers about nutritious, varied, delicious, and economical healthy foods.

The data in Table 1 were collected using a structured questionnaire distributed via Google Forms. The questionnaire was targeted at parents and was mainly distributed via WhatsApp groups. Participants were asked to answer a series of questions about their demographic characteristics, such as gender, age, education, occupation, income, and food expenditure. Data collection began with an explanation of the purpose of the research, and informed consent was given to the respondents prior to data collection. The respondents were then asked to complete the questionnaire online. The data were then entered into Microsoft Excel and processed using SPSS Statistics version 26.

RESULT

Characteristics of participants

Table 1 shows that the characteristics of the parents of PAUD Baitussalam students in the Affordable, Nutritious and Tasty Meals (NEAT) nutrition education are dominated by women, with 70% being mothers under the age of 40. The majority of participants had a good educational background, with more than 55% having a university degree. Most of them, 70%, worked as housewives, and more than 70% had a monthly household income and expenditure of more than IDR 5 million.

Habits of parents in implementing a balanced diet

The results in Table 2, prior to the implementation of this community service programme, show that the parents of PAUD Baitussalam students have varied

Table 1. Characteristics of the participants

Characteristics	n	%
Gender		
Male	6	30.0
Female	14	70.0
Age group		
<40 years old	14	70.0
≥40+ years old	6	30.0
Last education		
High school/equivalent	1	5.0
Higher education diploma	3	15.0
Bachelor's degree	11	55.0
Master's degree	5	25.0
Occupation		
Housewife	14	70.0
Private employee	2	10.0
Civil servant	1	5.0
Other	3	15.0
Monthly income		
< Rp. 1.000.000	1	5.0
Rp. 1.000.000- Rp. 2.000.000	1	5.0
Rp. 2.000.001- Rp. 3.000.000	1	5.0
Rp. 4.000.001- Rp.5.000.000	1	5.0
> Rp. 5.000.000	16	80.0
Monthly food expenditure		
Rp. 500.000- Rp. 1.000.000	1	5.0
Rp. 2.000.001- Rp.3.000.000	1	5.0
Rp. 3.000.001- Rp. 5.000.000	4	20.0
>Rp. 5.000.000	14	70.0
Total	20	100.0

habits in implementing a balanced diet. As many as 55% of the parents seldom bring meals that meet the requirements of a balanced diet, and 60% rarely include vegetables in their child's meals. However, there are positive habits: 80% of children often eat with the family, and 85% of parents frequently provide a balanced diet at home. Most parents (90%) usually give their children pocket money to take to school, which may indicate a preference for flexibility in children's food choices.

In addition, 55% of parents reported that their children often drank enough water. Limiting sugar, salt, and oil consumption was also well implemented by 80% of parents. The habit of washing hands before eating is excellent, with all parents reporting that their children always wash their hands before eating. Consumption of a variety of animal side dishes was typical in 95% of families, and 55% of families frequently consumed a variety of staple foods.

Socialisation and nutrition education for school officials

The first series of activities of the NEAT program is socialization in April 2023 through WhatsApp groups to schools by conducting discussions and coordination to reach an agreement on the schedule of activities and needs that need to be prepared before conducting nutrition counseling and the practice of making balanced and economical nutritious food. The implementation of counseling on a healthy, nutritious, varied, delicious, and economical food menu is divided into two meetings, the first for the school and the second for students, as seen in Figure 3.

The first meeting with teachers and parents using PowerPoint media and a pocket book on 26 May 2023, with an interactive discussion. Socialisation and Education on Affordable, Nutritious and Tasty Meals (NEAT) with teachers and guardians online through Zoom successfully gathered 20 participants.

Table 2. Parental habits in applying the principles of a balanced and nutritious diet in the family

Parents' balanced eating habits	n	%
My child's meals are nutritionally balanced		
Often	9	45.0
Rarely	11	55.0
I include vegetables in my child's meals		
Often	8	40.0
Rarely	12	60.0
My child eats with my family		
Often	16	80.0
Rarely	4	20.0
My child's diet is nutritionally balanced		
Often	17	85.0
Rarely	3	15.0
I give my child pocket money for school		
Often	2	10.0
Rarely	18	90.0
My child drinks enough water		
Often	11	55.0
Rarely	9	45.0
I limit the consumption of sugar, salt, and oil		
Often	16	80.0
Rarely	4	20.0
My child washes their hands before eating		
Often	20	100.0
Never	0	0.0
My family eats a variety of animal-based side dishes		
Often	19	95.0
Rarely	1	5.0
My family eats a wide variety of staple foods		
Often	11	55.0
Seldom	9	45.0
Total	20	100.0

Table 3. Percentage of participants who correctly answered knowledge questions about Affordable, Nutritious and Tasty Meals (NEAT)

Knowledge	Pre		Post	
	n	%	n	%
Definition of nutrients	13	100,0	13	100,0
The importance of nutrition for children	13	100,0	13	100,0
Signs of healthy growth and development	12	92,3	11	84,6
Principles of balanced dietary guidelines	13	100,0	13	100,0
How to make meals affordable	12	92,3	13	100,0
Food sources of vitamins and minerals	10	76,9	11	84,6
Portions of animal products on a child's plate	3	23,1	8	61,5
The right drink to accompany meals	13	100,0	13	100,0
Nutritious and economical side dishes	11	84,6	11	84,6
How to make disliked foods more appealing to children	10	76,9	13	100,0

Before the materials were presented, all participants had to answer some questions from the pre-test questionnaire, the content of which was related to

the materials to be given. After the programme, all participants also had to complete questions from the post-test questionnaire.

Table 3 shows some interesting findings on participants' knowledge before and after the Nutrition Education for Affordable, Nutritious and Tasty Meals (NEAT) programme in PAUD Baitussalam, Depok, West Java. Understanding of the definition of nutrients, the importance of nutrition for children, the principles of balanced dietary guidelines, and complementary drinks remained consistently high at 100.0% both before and after the programme. This indicates that participants had excellent knowledge of basic nutrition concepts even before the NEAT programme was implemented, and that the programme was successful in maintaining this level of knowledge.

In addition, several aspects of knowledge showed significant improvement after the programme. Knowledge of how to prepare food that children like increased from 92.3% to 100.0%, and knowledge of how to prepare food that children do not like increased from 76.9% to 100.0%. Other improvements were seen in knowledge of the proportion of animal accompaniments on children's plates, which increased from 23.1% to 61.5%, and knowledge of food sources of vitamins and minerals, which increased from 76.9% to 84.6%. In contrast, knowledge of the signs of good growth and development decreased from 92.3% to 84.6%, which needs further attention. And the understanding of how to choose nutritious and economical side dishes did not increase (remained) with the same score before (pre) and after (post) the programme, which was 84.6.

Evaluation of participants' attitudes towards the NEAT nutrition education statements showed that the majority of participants continued to agree with the importance of eating a nutritionally balanced diet, introducing a variety of foods at an early age, and limiting the consumption of sweet and salty snacks, with the proportion agreeing remaining at 100% before and after the programme (Table 4). This suggests that participants' awareness of the basic principles of a balanced diet and healthy eating behaviour was already very good to begin with, and that the NEAT programme was successful in maintaining these positive attitudes.

However, there was an increase in the proportion of participants who disagreed

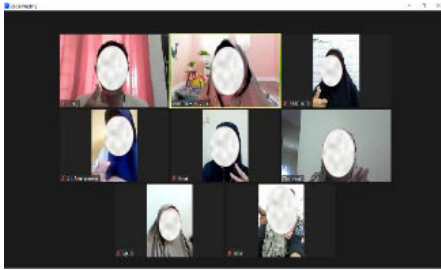


Figure 3. Coordination and integration with the school programme.

Table 4. Proportion of participants agreeing and disagreeing with some statements about affordable, nutritious, and tasty meals (NEAT)

Attitude	Pre		Post	
	n	%	n	%
Eating according to a balanced diet				
Agree	13	100,0	13	100,0
Disagree	0	0,0	0	0,0
Introducing a variety of foods from an early age				
Agree	13	100,0	13	100,0
Disagree	0	0,0	0	0,0
Children's eating problems are easy to solve				
Agree	5	38,5	7	53,8
Disagree	8	61,5	6	46,2
Children's portions are half the size of an adult's				
Agree	5	38,5	7	53,8
Disagree	8	61,5	6	46,2
Limit consumption of sweet and savoury snacks				
Agree	13	100,0	13	100,0
Disagree	0	0,0	0	0,0
Giving pocket money rather than meals				
Agree	1	7,7	1	7,7
Disagree	12	92,3	12	92,3
Children like to talk about their favourite meals				
Agree	13	100,0	12	92,3
Disagree	0	0,0	1	7,7
Meals should be rich in vegetable side dishes				
Agree	6	46,2	8	61,5
Disagree	7	53,8	5	38,5
Nutritious, healthy food is usually expensive				
Agree	2	15,4	1	7,7
Disagree	11	84,6	12	92,3
Meal frequency is exactly 3-4 times a day				
Agree	12	92,3	9	69,2
Disagree	1	7,7	4	30,8

with the statement that nutritious, healthy food is usually expensive, from 84.6% to 92.3% after the programme. This suggests that the NEAT programme was successful in changing participants' perceptions of the cost of healthy food, reinforcing the belief that nutritious food need not always be expensive. In contrast, the proportion of participants who disagreed that children's eating problems are easy to solve and that

children's portions are half their size fell from 61.5% to 46.2%. In addition, the proportion disagreeing that meals should be rich in vegetables also dropped from 53.8% to 38.5%. This decline suggests that participants may still find it challenging to put the principles of good nutrition into daily practice.

There was also a decrease in the majority of participants agreeing with some

aspects. The percentage of participants agreeing that the frequency of meals 3-4 times a day is appropriate decreased from 92.3% to 69.2%, and that participants who like to discuss what they like decreased from 100% to 92.3%. Although these decreases are not significant, they suggest that there is room for improvement in communicating the importance of regular mealtimes and involving children in food choices. The proportion of participants who disagreed with giving pocket money for meals remained constant at 92.3%, indicating that the majority still believe providing meals is preferable to giving pocket money.

Table 5 shows that the Affordable, Nutritious and Tasty Meals (NEAT) programme significantly improved participants' knowledge scores. The average knowledge score before the programme was 84.6, and after the programme it increased to 91.5. T-tests on knowledge scores showed significant results with a p-value of 0.044. This increase reflects the effectiveness of the programme in providing participants with information and a better understanding of a balanced diet and the importance of nutritious food for children that does not have to be expensive.

However, different results were seen in the participants' attitude scores—the average attitude score before the programme was 45.4, which slightly decreased to 44.2 after the programme. The t-test of attitude scores showed an insignificant result with a p-value of 0.831, meaning that this change was not strong enough to be considered a real effect of the NEAT programme. This suggests that although the participants' knowledge increased, the shift in attitude was not in line with the increase in knowledge.

Overall, the NEAT programme succeeded in significantly increasing

Table 5. Mean and standard deviation, and an independent t-test of attitude and knowledge scores before and after the Affordable, Nutritious and Tasty Meals (NEAT) programme

Score (n=13)	Mean	SD	p-value
Knowledge level			
Pre	84.6	10.5	0.044*
After	91.5	5.5	
Attitude			
Pre	45.4	6.5	0.831
Post	44.2	6.3	



Figure 4. NEAT nutrition education for PAUD Baitussalam students with a snakes and ladders game and stickers.

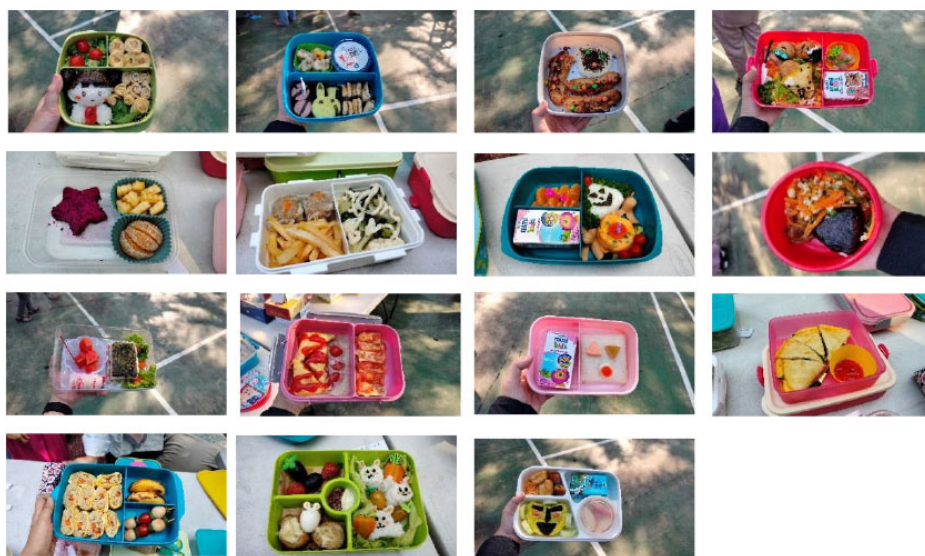


Figure 5. Documentation of the meals design competition.

participants' knowledge, but did not succeed in substantially changing participants' attitudes. This suggests that, in addition to knowledge, attitude change requires a more in-depth and sustainable approach. Future programmes may need to focus on more effective strategies to change attitudes, such as through hands-on practice, group discussions, or more interactive activities, to ensure that the knowledge gained can be implemented in daily actions.

Snakes and ladders game and stickers

The second session on May 31 was attended by 20 students and consisted of

the Snakes and Ladders mat game and stickers on the Affordable, Nutritious, and Tasty Meals (NEAT) menu. Nutrition education using the Snakes and Ladders game and stickers has been proven effective and is recommended for early childhood.⁹ This game is designed for children aged 3–5 years and is integrated into PAUD activities.¹⁰ In the Snakes and Ladders game, each child gets a turn to roll the pillow dice, and each step requires them to answer questions about types of protein-rich foods, fruits, and vegetables. In the sticker stick game, children choose nutritious foods to cut and stick on the empty food box sticker board and then

name the food, as seen in Figure 4. The participants, all young children, were very enthusiastic about the game.

Meals Creation Competition

Food Creation Competition is an activity that integrates affordable, nutritious, and delicious food into student graduation activities. This activity is a competition to make healthy, nutritious, varied, tasty, and economical food involving pairs of parents and students, as shown in Figure 5. This activity aims to strengthen the relationship between parents and children to understand how to make a healthy, nutritious, varied, delicious, and economical menu. This activity is assessed by the principal, teachers, and the Sahid University team.

The average scores of the 14 participants from different aspects of the assessment are as follows: food/drink price (84.4), adherence to balanced nutrition principles (84.0), flavour innovation (83.2), creativity of presentation (82.6), and choice of food type (81.5). The high scores in these categories reflect the knowledge and attitudes of the participants in applying the previous nutrition education to provide economical, yet tasty and nutritious children's meals. The participants successfully developed menus with balanced nutritional proportions, offered innovative variations of dishes, and packaged them in visually appealing presentations.

The competition highlighted the importance of providing affordable food without compromising on nutritional value, while encouraging creativity in presentation and the exploration of new flavours. The results also reflected participants' adaptation to the increasingly diverse needs and preferences of today's consumers. Overall, the competition demonstrated that with the right approach, healthy and delicious food can be made available to more people at an affordable cost, in line with current market demands that increasingly prioritise health and nutritional value in daily food choices.¹¹

DISCUSSION

Based on the results and discussions presented, the NEAT education program has shown promising outcomes among

parents of early childhood education (ECE) students at PAUD Baitussalam. The participants, characterized by a relatively young demographic, higher education levels, and economic stability, represent a conducive environment for program implementation, as they possess adequate resources and knowledge to apply the principles taught effectively. This demographic profile aligns with findings from studies emphasizing the role of parental education and socioeconomic status in influencing dietary habits and nutritional knowledge within families.¹²

Regarding parental habits in balanced nutrition application, while improvements are needed in consistent provision of balanced meals and incorporating vegetables, most meal practices already align with balanced nutrition principles. Family involvement in shared meals and restrictions on unhealthy foods indicate a good awareness of healthy eating habits.¹³ Such findings underscore the potential for targeted education and encouragement to enhance nutritional practices among parents further, aligning with research advocating for sustained educational efforts to bolster dietary habits within families.¹⁴

The coordination meetings, facilitated via digital platforms like WhatsApp and Zoom, successfully integrated school schedules and parental involvement strategies, demonstrating effective communication and engagement strategies crucial for program success. Challenges such as parental availability during working hours and connectivity issues were mitigated by scheduling evening sessions and ensuring technical support during online meetings.¹⁵

The NEAT program's effectiveness in maintaining and enhancing participant knowledge, despite certain areas requiring further improvement, highlights its important role in increasing nutritional awareness and fostering healthier eating behaviors among children. Areas such as understanding growth indicators and identifying affordable yet nutritious meal options emerge as key focal points for future program evaluations and improvements.¹⁶ Moreover, while the program has solidified knowledge, the need

for deeper attitudinal changes suggests future iterations could benefit from more interactive and sustained approaches to embed nutritional principles into daily routines effectively.^{10, 17}

The integrating of educational games and interactive activities like the NEAT program within ECE settings has proven effective in enhancing nutritional knowledge and behaviors among young children. Studies highlight the effectiveness of such approaches in fostering healthy eating habits early on, contributing to long-term health benefits.^{9, 10} Moving forward, initiatives like the NEAT competition can serve as catalysts for the broader adoption of affordable, nutritious, and tasty meals, ensuring healthier dietary practices among children and families alike.¹⁸ It should be noted that there are certain limitations in data collection, as this study was conducted online. In-depth interviews on knowledge and attitudes towards health and economic provision were needed. It is therefore recommended that further research be conducted with a better design to gain insight and refine the findings.

CONCLUSION

The Nutrition Education for Affordable, Nutritious and Tasty Meals (NEAT) programme implemented at PAUD Baitussalam in Depok, West Java, demonstrated significant improvements in nutrition knowledge among teachers, parents, and students, despite initial challenges in terms of attitudes. By using digital platforms for coordination and incorporating engaging activities such as educational games and healthy eating competitions, NEAT effectively engaged participants and improved their understanding of a balanced diet. The programme's success highlights the importance of targeted educational interventions in early childhood settings to promote sustainable, healthy eating habits. Future iterations should focus on refining strategies to address time constraints and further embed nutrition principles into daily routines to ensure continued positive impact on dietary practices within the school community and beyond.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest. The decision to submit this work for publication was made independently by the authors, and the Institute for Research and Community Services at Sahid University had no role in influencing the content of the manuscript. And none of the authors have served on the editorial board of the Journal of Community Medicine and Public Health (JCOEMPH), and none are affiliated with organizations that would benefit financially from the publication of this article.

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AUTHOR CONTRIBUTION

HW, principal investigator, conceptualised and designed the program, prepared the draft of the manuscript, data analysis and interpretation, assisted in drafting of the manuscript and reviewed the manuscript; AT, member investigator, conceptualised and designed the study, prepared the draft of the manuscript for introduction. USN and SA, member investigators, reviewed the manuscript format, conducted

the study, and assisted in drafting the manuscript for the results.

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