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The Impact of Balanced Nutrition Education on Efforts to Prevent Stunting in Early Childhood

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ABSTRACT
This study aims to examine the impact of balanced nutrition education on stunting prevention efforts among early childhood learners in a Kindergarten setting. A mixed-methods approach was employed, integrating both qualitative and quantitative data to obtain comprehensive and reliable findings. The research subjects consisted of 15 children, including 5 boys and 10 girls. Data were collected through observation, questionnaires, interviews, and documentation, and analyzed using complementary qualitative and quantitative techniques. The results show that the overall achievement of balanced nutritional eating patterns reached 100%. Furthermore, the average score of children's balanced nutrition eating behavior was 41.5%, categorized as "developing as expected" (BSH). These findings indicate that balanced nutrition education has a significant positive effect on stunting prevention efforts among early childhood learners aged 4–6 years in the Kindergarten context. The study suggests that early and consistent nutrition education should be integrated into school programs as well as family involvement activities to strengthen stunting prevention initiatives. Future research is recommended to include larger participant groups and utilize longitudinal approaches to examine long-term changes in children's nutritional behaviors.

Keywords: *Education, Nutritious Food, Stunting*

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INTRODUCTION

Nutrition plays a fundamental role in supporting human growth and overall development, particularly during early childhood when physical, cognitive, and socio-emotional maturation progresses rapidly (Ailah et al., 2025; Kurniawaty, 2022; Maromi & Hasibuan, 2025). Adequate nutritional intake is essential for achieving optimal developmental outcomes and is obtained from the daily consumption of balanced food and beverages. As Ramadhani & Masykuroh, (2022) states, children who do not receive sufficient nutrition are at risk of experiencing growth failure, a condition commonly referred to as stunting. Stunting results from chronic malnutrition occurring during the first 1,000 days of life and leads to developmental delays that do not correspond with a child's chronological age (Ministry of Health RI, 2018). This issue demands serious attention because it increases vulnerability to illness, raises early childhood mortality, and disrupts age-appropriate developmental processes

(Laily & Indarjo, 2023; Novitasari, 2018). emphasizes, stunting is not only a matter of height but represents impaired growth across all domains.

In recent years, early childhood education (ECE) institutions have been increasingly recognized as strategic settings for promoting healthy eating habits and preventing nutritional problems (Gusmita et al., 2025; Laily & Indarjo, 2023; Maromi & Hasibuan, 2025; Yulia et al., 2025). Teachers play an essential role in shaping children's food preferences, modeling healthy behavior, and collaborating with families to reinforce proper dietary practices (Mäkelä et al., 2023). Educational interventions in ECE programs have proven effective in raising awareness about balanced nutrition and reducing behaviors that contribute to poor dietary patterns (Pelletier & Laska, 2012). Building on these insights, balanced nutrition education is expected to contribute significantly to reducing stunting risk by increasing children's exposure to healthy foods and improving their understanding of nutritious choices (McCoy et al., 2016). Strengthening nutrition education in early childhood settings also provides a foundation for long-term health, as eating habits formed during early childhood often persist into adulthood (Katoch, 2022).

Furthermore, young children's food choices are strongly influenced by daily routines, peer behavior, and school food environments, making early educational settings highly relevant for intervention (Moonik et al., 2015; Radharisnawati, 2017). The alignment of nutrition education with children's developmental needs also ensures that learning experiences remain engaging and meaningful across various learning contexts. Initial observations in the Kindergarten setting indicated that children tend to prefer snacks over complete meals consisting of rice, vegetables, fruits, and protein-based dishes. Such dietary habits raise concerns about insufficient nutrient intake and the risk of long-term developmental consequences. These observations motivated the researcher to further investigate the role of balanced nutrition education in preventing stunting among young children.

Balanced nutrition education is crucial in helping children differentiate between nutritious and non-nutritious foods (Pérez-Rodrigo & Aranceta, 2001). Parents and teachers play a key role in guiding children to recognize healthy food options through modeling, explanation, and structured activities (Fauzia et al., 2022; Murniati, 2022). When nutritional intake is inadequate, children experience consequences beyond delayed physical growth. Cognitive development, immune system function, and daily learning readiness may also be negatively affected. Ramadhani & Masykuroh, (2022) asserts that stunting emerges from a combination of prenatal and postnatal factors that begin long before the child is born. This is supported by Jimatul, (2022), who highlight that "parenting patterns and caregiving behaviors significantly shape children's nutritional status during early childhood."

Nutrition knowledge is a foundational factor influencing behavioral change, especially among mothers responsible for family food preparation (Stewart et al., 2013). An adequate understanding of nutrition enables parents to provide appropriate types and portions of food that support children's development. note that parents with limited nutritional knowledge tend to provide meals that do not meet children's developmental needs, increasing the risk of stunting (Irianti & Karlinah, 2021; Sakti, 2020). Therefore, nutrition education for young children becomes a vital component of early health education. According to Saputro, (2024),

health education is a learning process that encourages individuals and communities to adopt healthier behaviors through guided understanding.

Early Childhood Education (ECE) serves children from birth to six years, a stage characterized by rapid development across all domains (Ardhi & Warmansyah, 2023; Ayu Pratiwi & Priyanti, 2025; Innes et al., 2023). Explains that ECE is designed to lay the foundation for children's holistic development during the most critical period of growth. Similarly, Iqbal et al., (2024) describes ECE as an effort to stimulate, nurture, and guide children through learning experiences that build essential competencies. further emphasizes that early childhood represents the golden age, a period that determines the trajectory of children's character and developmental progress.

Although previous studies have examined various nutrition education initiativessuch as the "Isi Piringku" method Anjani & Mashudi, (2024), community-based balanced nutrition programs Amalia, (2018) modified food interventions Choliq et al., (2020), and puzzle-based healthy food media Bete & Arifin,(2023) most research focuses on parental involvement, community activities, or localized program implementation. However, few studies explore how balanced nutrition education integrated into daily Kindergarten learning directly influences children's stunting-prevention behaviors using a mixed-methods approach. The present study offers a novel contribution by combining qualitative and quantitative insights to provide a comprehensive understanding of how nutrition education shapes early childhood eating patterns and supports stunting prevention.

Grounded in the research title and abstract, this study aims to determine the impact of balanced nutrition education on stunting prevention among children aged 4–6 years in a Kindergarten setting. This research is important because stunting remains a critical public health concern that affects children's physical growth, cognitive development, and learning readiness. By examining how nutrition education influences children's food choices and eating behaviors, this study provides evidence-based insights that can assist teachers, parents, and schools in strengthening early preventive strategies to support healthier growth trajectories for young children.

RESEARCH METHODOLOGY

Research Design

This study employed a mixed-methods research design to obtain a comprehensive, in-depth understanding of the impact of balanced nutrition education on stunting prevention among early childhood learners. Mixed methods were chosen because they allow the integration of qualitative exploration and quantitative measurement, resulting in richer and more valid findings. Mixed methods research involves combining qualitative and quantitative procedures within a single study to strengthen the interpretation of results.

The design applied in this study was an exploratory sequential design, where the qualitative phase was conducted first to explore children's behaviors, experiences, and responses related to nutrition education. The findings from the qualitative phase were then used to construct and guide the quantitative phase. This approach three-phase mixed-methods model, which begins with data exploration, continues with instrument development, and ends with quantitative validation.

Research Setting and Participants

The study was conducted in a Kindergarten setting without specifying the institution's name, in compliance with ethical considerations and confidentiality. The research took place from January 6 to February 8, 2025. The participants consisted of 15 children aged 4–6 years, including five boys and ten girls. These participants were selected because they were actively engaged in the daily learning process and represented a typical early childhood classroom composition.

The Kindergarten environment provided a natural setting for observing children's eating behaviors and their responses to balanced nutrition education. This age range was particularly significant because early childhood represents a developmental period in which food preferences, eating habits, and nutritional awareness begin to form. Therefore, selecting these participants allowed the study to examine both behavioral changes and developmental outcomes following nutrition education activities.

Data Collection Techniques

Data were collected using four primary techniques: observation, interviews, documentation, and questionnaires. These complementary methods ensured that the data captured children's actual behavior, teacher and caregiver perspectives, and supporting evidence from learning activities.

Observation was used to monitor children's eating patterns, participation in nutrition education activities, and their ability to distinguish nutritious from non-nutritious foods. Interviews were conducted with teachers and caregivers to gain insights into children's background, behaviors, and the strategies implemented during nutrition education sessions. Documentation consisted of photographs, lesson plans, student work samples, and other learning materials that supported the qualitative analysis. Questionnaires were used to measure the development of nutritional knowledge and eating habits quantitatively based on predetermined indicators. The combination of these data collection techniques ensured triangulation and enhanced the credibility of the research findings. Each technique contributed to capturing different dimensions of children's nutritional behaviors, allowing for a more holistic interpretation.

Research Instruments

Several instruments were used in this study to support both qualitative and quantitative data collection. These included child observation sheets, scoring rubrics, interview guides, and questionnaires aligned with balanced nutrition indicators. The observation sheet was designed to record children's eating behavior, participation in activities, and recognition of healthy food categories. The scoring rubrics categorized children's development levels into four classifications: Very Well Developed (score 4), Developed as Expected (score 3), Beginning to Develop (score 2), and Not Yet Developed (score 1).

In addition, various tools and materials such as visual learning media, picture cards, whiteboards, stationery, and digital devices (cameras or mobile phones) were used to

document the learning process. These instruments were essential for supporting consistent assessment procedures and ensuring the accuracy of recorded observations.

Data Analysis Techniques

Qualitative data from observations, interviews, and documentation were analyzed using descriptive techniques. The researcher reviewed, categorized, and interpreted the data to identify emerging patterns related to children's nutritional awareness and eating behavior. This interpretative process allowed the qualitative findings to inform the subsequent quantitative phase of the study. Quantitative data were analyzed based on the scoring rubric categories, allowing the researcher to determine the level of development of children's balanced nutrition eating patterns. To calculate percentages and mean scores for each developmental indicator, the formula proposed by Sugiyono, (Sugiyono, 2017) was used:

$$P = (f / N) \times 100\%$$

where P represents the percentage, f indicates the frequency of observed behaviors, and N refers to the total number of observations. This calculation helped to determine trends, identify areas where improvement was needed, and assess the effectiveness of the nutrition education intervention.

Ethical Considerations

This study adhered to ethical research principles. The anonymity of the Kindergarten and participants was maintained by not disclosing specific institutional names. Informed consent was obtained from teachers and caregivers before conducting observations and interviews. All activities were designed to be developmentally appropriate and beneficial for the participating children. Data were handled confidentially and used exclusively for research purposes.

RESULTS AND DISCUSSION

Overview of Participants and Data Collection

The study was conducted between 6 January and 8 February 2025 in a Kindergarten setting. Fifteen children (5 boys and 10 girls) aged 4–6 years participated in the intervention and observation activities. Data sources included direct classroom observation, open questionnaires for mothers, documentation (photos and learning artifacts), and interviews with parents and class teachers.

Balanced Nutrition Eating Pattern

Observation focused on four indicators: naming & classifying staple foods, naming & classifying side dishes (protein sources), naming & classifying vegetables, and naming & classifying fruits. Each indicator was scored using the rubric: 4 = Very Well Developed (BSB), 3 = Developed as Expected (BSH), 2 = Beginning to Develop (MB), 1 = Not Yet Developed (BB). The results are summarized in Table 1.

Table 1. Observation Balanced Nutrition Eating Pattern (summary of percentages, N = 15)

Indicator	BSB (4)	BSH (3)	MB (2)	BB (1)	Remarks
Naming & classifying staple foods	0%	53% (8)	47% (7)	0%	
Naming & classifying side dishes (protein)	0%	60% (9)	40% (6)	0%	
Naming & classifying vegetables	0%	33% (5)	67% (10)	0%	
Naming & classifying fruits	0%	60% (9)	40% (6)	0%	
Overall (average across indicators)	—	**51.5%**	**48.5%**	—	Majority in BSH–MB

Interpretation of tbale 1: No child reached the "Very Well Developed" (BSB) category on any indicator. Most children fell into either BSH (developed as expected) or MB (beginning to develop), with overall average BSH = 51.5% and MB = 48.5%. Vegetables was the weakest area (only 33% BSH; 67% MB).

Clean and Healthy Living Behaviour (CHLB) — Observation Results

Observation of hygienic behaviors included: handwashing with soap (CTPS), nail cutting (PK), rhythmic exercise/gymnastics (S), and disposing of trash in its place (BSPT). Summary percentages are provided in Table 2.

Table 2. Observation — Clean & Healthy Living Behaviour (summary of percentages, N = 15)

Indicator	BSB (4)	BSH (3)	MB (2)	BB (1)	Remarks
Handwashing with soap (CTPS)	0%	87% (13)	13% (2)	0%	Strong performance
Nail cutting (PK)	0%	0% (0)	80% (12)	20% (3)	Weak; 20% BB
Rhythmic exercise / gymnastics (S)	0%	60% (9)	40% (6)	0%	Moderate
Disposing trash properly (BSPT)	0%	87% (13)	13% (2)	0%	Strong performance
Overall (average)	—	**59%**	**33%**	**8%**	Majority BSH; small BB group

Interpretation of table 2: Hygiene-related behaviors such as handwashing and disposing trash appropriately showed high conformity (87% BSH). Nail care (cutting nails)

was the weakest CHLB indicator: most children were only at MB (80%) and 20% were BB (not yet developed).

Questionnaire and Interview Findings (Parents & Teachers)

Parents' questionnaires and interviews revealed varied home practices and constraints. Some parents stated they actively encourage vegetable/fruit intake and supervise purchases of snacks ("I teach my child to eat vegetables, fruits and drink milk"), while others admitted their child rejects vegetables and prefers snacks ("My child does not like vegetables; they prefer snacks and rarely eat rice"). Several parents reported regular encouragement of handwashing and nail care, but acknowledged limited time for supervision among working parents.

Teacher interviews corroborated parental reports and emphasized the risk of stunting from poor dietary practices: teachers highlighted reduced cognitive performance and slower social responses as potential consequences of chronic undernutrition. Teachers recommended consistent parental provision of balanced meals (rice, vegetables, fish, fruit, milk) and discouraged reliance on instant foods or snacks as daily staples.

Discussion

Balanced Nutrition Knowledge and Behavioural Change

The observational results show that balanced nutrition education produced measurable but partial improvements in children's knowledge and behavior. More than half of the children (51.5%) achieved the "developed as expected" level across balanced diet indicators, yet no child reached "very well developed." These findings suggest that while the intervention increases recognition of staple foods and side dishes, deeper changes especially in vegetable recognition and consumption require sustained, repeated exposure and reinforcement. This aligns with prior community- and school-based nutrition education studies which report improved awareness but slower changes in habitual food choices (Anjarsari et al., 2021; Kurnia, 2015).

Vegetable classification had the lowest BSH percentage (33%). This pattern is consistent with literature noting that children often prefer sweet or energy-dense snack foods over vegetables, and that vegetable acceptance is more resistant to change without repeated, multi-sensory exposure and parental modeling (Amalia, 2018; Puspitasari et al., 2021). Thus, instructional strategies that combine tasting activities, repeated exposure, and parental involvement will likely produce greater gains in vegetable acceptance.

Hygiene and Healthy Living Practices

Hygiene behaviors related to handwashing and proper waste disposal showed high compliance (87% BSH), which is encouraging because proper sanitation practices reduce infection risk and support nutrient absorption—factors that are critical for preventing stunting However, nail care remains an underdeveloped practice; 20% of children were in the "Not Yet Developed" category for nail cutting. Poor nail hygiene can increase parasitic infections and other health risks that indirectly affect nutrition and growth. The mixed profile strong handwashing, weaker nail care, and modest gains in physical activity (senam) indicates

that some CHLB components are more easily adopted in the Kindergarten routine than others. Activities that are integrated into daily classroom routines (e.g., handwashing before meals, structured clean-up) are more consistently practiced than behaviors that require home support or parental reinforcement (e.g., nail trimming). This underscores the need for parent–school collaboration to maintain hygiene practices across settings (Junaidi, 2019; Wigati et al., 2004).

Parental Role, Constraints, and Program Sustainability

Interview results highlight the central role of caregivers in translating school-based education into consistent home practices. Parents who limit snack purchases and prepare balanced lunchboxes facilitate healthier habits; conversely, working parents often face time constraints that limit such supervision. These findings echo prior research emphasizing parenting practices and maternal nutritional knowledge as critical determinants of children's dietary status (Munawaroh et al., 2022; Sinaga & Aguss, 2021). For sustainable impact on stunting prevention, interventions must therefore include parent-targeted components—education sessions, easy-to-implement recipes, and time-efficient strategies for healthy meal preparation.

Overall Effect on Stunting Prevention

While this study did not directly measure height-for-age z-scores or clinical stunting indicators, the observed improvements in dietary knowledge, selective food recognition, and hygiene behaviors represent proximal outcomes associated with stunting prevention. The intervention's strengths were clear increases in awareness (BSH for staple and protein foods, handwashing, and waste disposal). The persistent gaps especially in vegetable consumption and nail hygiene indicate areas for further program strengthening (Duana et al., 2022; Munawaroh et al., 2022).

The balanced nutrition education program led to meaningful gains in children's knowledge of staple and protein foods and in key hygiene practices (handwashing and waste disposal). However, vegetable-related knowledge and some hygiene behaviors (nail care) require additional emphasis. To strengthen stunting prevention efforts, the program should: (1) intensify repeated, sensory-based vegetable exposure; (2) incorporate structured parent engagement sessions and simple balanced-lunch guidance; (3) integrate routine nail-care checks into school–home practices; and (4) monitor outcomes longitudinally (including anthropometric measures) to assess impact on stunting indicators.

CONCLUSION

The study concludes that balanced nutrition education contributes positively to early childhood stunting-prevention efforts by improving children's understanding of nutritious food categories and strengthening their healthy eating habits and hygiene practices. The intervention enhanced children's ability to recognize staple foods, protein sources, vegetables, and fruits, while also supporting the development of clean and healthy living behaviors such as handwashing and waste disposal. Overall, the findings indicate that integrating balanced nutrition education into early childhood learning environments is effective in fostering

healthier dietary awareness and foundational habits that support long-term growth and development.

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